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GAS JOURNAL

LIGHT • HEAT • POWER • BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

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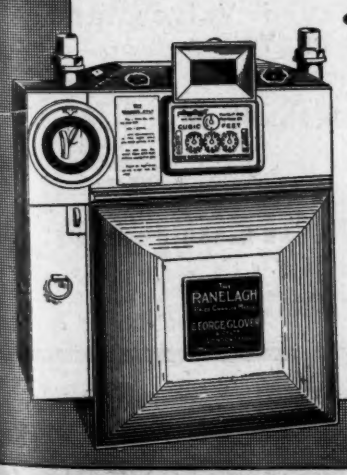

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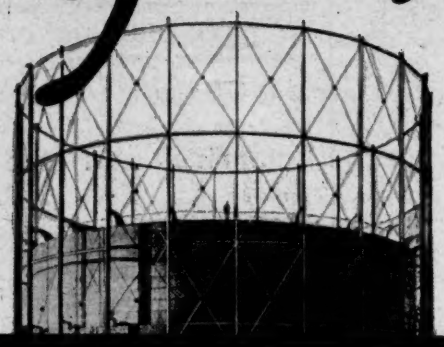

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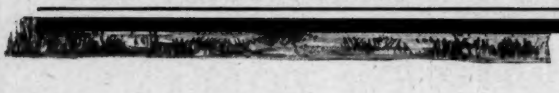

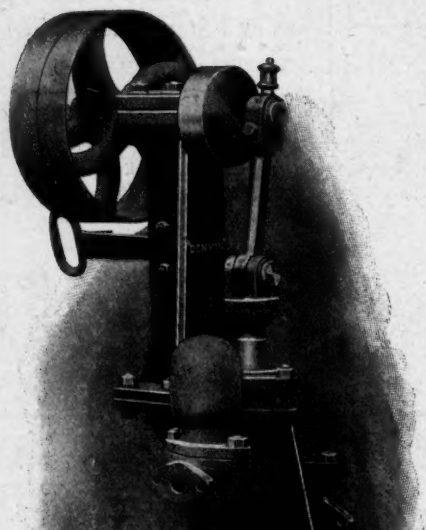

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VOL. CLXIV., No. 3161.] WEDNESDAY, DECEMBER 12, 1923. [75TH YEAR.

EDITORIAL NOTES.

The General Election.

THE result of the General Election will be anything but satisfactory to the industrialists of the country, whatever their political views. It is now freely realized that a great mistake was made in political tactics, however well-meaning the movement was in seeking an avenue to some amelioration of that heavy current difficulty—unemployment. The intention was no doubt good. If, too, we are agreed that the imposition of tariffs on manufactured imports is one means of reducing the severity of the industrial conditions from which we are suffering to-day, then the time was particularly opportune for making such a radical change. But the polling has proved that it was inopportune in other respects. The change was far too revolutionary for a General Election to be rushed upon the country as was this one; and it was a change up to which, having regard to the constitution of the electorate to-day, there had been no time fully to educate the country. This especially applies to our womenfolk, who have to keep a sharp eye upon the household budget, and most of whom in working-class constituencies are keenly opposed to anything which will tend to increased cost without any obvious counterbalancing advantage. Beyond this they do not look, and in fact, within the limits of their knowledge of these matters, cannot see. They are not to be blamed for their attitude. The blame rests with those who, desiring to benefit the country, had not put the position clearly before them. Justice has given to every man and woman within certain defined limits the power to vote for what he or she believes to be the correct policy for the country; but that power cannot be exercised as it should be if people are more or less ignorant of the essentials to guide them to a proper determination.

The result of the General Election, so far as industry is concerned, is a disaster. Not two years ago it was urged that what industry required was tranquillity—freedom from legislation which would impede recovery, and a gradual lightening of the financial burdens which were hanging as millstones about the necks of the manufacturers of the country. Before the election we had a stable Government which permitted at any rate the freedom of industry from legislative interference; to-day, whatever happens, until there is another appeal to the electorate, there can be no Government—Conservative, Liberal, or Labour standing alone—other than of an unstable character. Any one of them would be impotent to do anything more than carry purely necessary legislation. It may be that, in the circumstances, there will be more tranquillity than with a Government having predominating power. But doubts exist. The Labour-Socialist Party are flushed with their success in securing additional members in the House; and there is no question that they at all events will not allow to pass unused opportunities for a little liveliness, though in the new House they will be as incapable of harm as the Conservative or Liberal Party would be powerless in the face of a combined vote by the other two Parties. However, the Labour-Socialist Party are jubilant. There are men in it whom we highly respect for their personal qualities, but with some features of whose policy we cannot associate ourselves, believing and knowing that they would be highly detrimental to the country. There is, for instance, the capital levy, which would, instead of assisting industry and employment, simply produce a worse condition of things than we are struggling against at present. Both Conservatives and Liberals are pledged to their constituents to oppose any such revolutionary legislation. It is true that the Labour Party have considerably swelled their numbers in the House; but an investigation of the voting shows that many of them are simply representing a class, and not the major part of their constituencies. Several secured their seats in triangular fights, but their supporters number far less than the united pollings of the Conservative and Liberal candidates. And taking the polling throughout the country, and adding Conservative and Liberal votes together, the capital levy and nationalization have been rejected in a manner far more emphatic than has protection. If ever it comes to a serious struggle between sane government and socialistic doctrines, Party considerations will have to be sacrificed, and a straight fight will have to be made in the constituencies with only one candidate in the field against Socialism. With this the Labour-Socialist Party could not disagree; they, the same as the other parties, desire a definite mandate from the country, and nothing less.

We do not know, and there has been no attempt to gauge, the views of the gas industry as to whether or not the major part was favourable to the Prime Minister's scheme of partial protection for the manufactures of the country. But it is interesting in this connection to note that the British Engineers' Association sent out an inquiry to member and non-member firms—embracing iron and steel manufacture, non-ferrous metal manufacture, shipbuilding, marine engineering, mechanical, electrical, and general engineering—asking whether they were in favour of the Prime Minister's policy. The number of replies received was 1894; and of these 81·8 p.ct. were in favour.

In the new House, there are comparatively few members directly interested in the gas industry. Among those who are, we again welcome Sir W. H. Cowan, Sir J. Brunner, and Mr. Reginald Clarry. Among those who are concerned in the labour organizations of the gas industry are the Rt. Hon. J. R. Clynes, Mr. Will Thorne, Mr. A. Hayday, and Mr. J. O'Grady. Whatever differences there may be in political views, these representatives of the Trade Unions connected with the industry are able to discuss and assist to legislate upon all matters confided to them by their Union constituents, without mixing them up in any way with their political beliefs and ideals. That is as things should be, where industrial peace is desired, and by men who hold their fellows in no less respect because their political opinions may not harmonize with their own.

However, reverting to the main topic. Though the General Election has placed the government of the country in a condition which has not given predominant power to any one party, we trust that this will not have any serious retarding effect upon what is so vitally desirable for the nation—the fullest possible recovery of our industrial activities and power.

Pipe Laying Practices and Problems.

MODERN traffic developments have brought to the front several problems for those who make use of the sub-soil of roadways for accommodating their distribution systems, as well as for those who are responsible for the making and the upkeep of roads. Between the two, there never was more need for collaboration than there is to-day. This being so, we would ask road authorities and their engineers to regard

the users of the sub-soil of roads as being, like themselves, servants of the public, and not nuisances which they have to tolerate. This aspect of the matter was impressed by Mr. Stephen Lacey, B.Sc., Assoc.M.Inst.C.E., the Distributing Engineer of the Gas Light and Coke Company, in the paper which he read at the Public Works, Roads, and Transport Congress, and which we publish to-day. The contribution was very appropriate to the occasion; and we are confident it will do much to clarify relations between road authorities and the sub-surface tenants, and give enlightenment regarding various problems in which both are concerned. The public-service side of the question was presented by Mr. Lacey in a distinctly novel manner, which showed that not only are gas undertakings rendering a public service by supplying by underground means fuel for domestic and industrial purposes, but are relieving the congestion upon, and the wear and tear of, road surfaces in an appreciable degree, and the atmosphere of a not immaterial proportion of pollution. He converted the gas distributed by the three Metropolitan Gas Companies into terms of tons; and he finds that they distribute 1 million tons of gas, which removes from the road surfaces at least 4 million tons of coal, together with the collection of ashes, &c. The greater part of the million tons of gas is used for cooking and heating. What it represents in units which are better understood, but perhaps are less popular, is shown by the fact that last year the three Metropolitan Gas Companies sold 256,116,463 therms. These were delivered to 1,406,732 consumers, through 4392 miles of mains, which represents an average of 320 consumers per mile of main. If, in place of the gas they burned, coal had been used by the nearly 1½ millions of consumers, the 4 million tons of coal would have had to be carried over the surfaces of the roads, adding by so much not only to the traffic, but interfering with it by the stoppage of the coal-carts at the houses or premises of the consumers for the purpose of delivery. In the discussion, some attempt was made to belittle the importance of this service so far as transport is concerned; but there are more effects in it than weight alone conveys. Moreover, there is a progressive transfer of patronage for heating from solid fuels to labour-saving gas, which will have a cumulatively larger effect on the use and wear and tear of road surface, and the presence of impediments to traffic.

There are several practical questions in connection with gas distribution in which both road and gas engineers are interested; and these were well brought out in the paper. One has to consider these matters in relation to old pipe work and new pipe work. If one, with present knowledge of traffic and road construction needs, were going to build a city or town *ab initio*, one would naturally apply to the plan existing information as to necessities; and one condition would be that, in the provision of roads for modern traffic, gas-mains would be laid as little as possible under the concrete beds and paved surfaces of the carriage ways. But gas distribution systems were laid and have grown under conditions that obtained long before traffic of the present-day kind came along; and the result is that the work of pipe alterations and repairs has now to be carried out (where concrete beds and paved surfaces rule) in circumstances that are both laborious and costly. But there is a little set-off to this; and it is that such road surfacings afford, with the new traffic, better protection to the subterranean gas-mains. Furthermore, Mr. Lacey finds that leakages from pipes reposing under such surfaces are not difficult to trace. We are inclined to think that is largely a matter of the constitution of the sub-soil—any escaping gas is bound to take the course of least resistance, with the result that sometimes the fact that there is a leakage is discovered some distance from its source; and then the latter is difficult to locate. Anyway, under the new conditions, no one would think of laying anything but trunk mains in the carriage ways of roads constructed as though they were to be for ever impregnable; and where the footpaths are sufficiently large to afford accommodation for trunk mains, they would go there in company with service-mains. But they would have to be exceptional footpaths that would to-day afford sufficient accommodation for all the transmission property of public utility services. Anyway, as Mr. Lacey points out, present practice in new work or alterations is to lay mains in a position which will cause the least disturbance of the roadways; and that is under the footpaths. The practice adds to the advantage of accessibility that of shortening of house service-pipes. Of course, no inflexible rule can be laid down. Every case must be dealt with in relation to its own circumstances. In some fairly narrow roadways, which have not been, or will not be for a time, constructed with Roman fortitude, a single service-main under one footpath may be all that is required, until conditions as to road surfacing alter, although we do not much like the idea of single stretches of house-service pipes running right across the roads. But in this matter again circumstances must decide procedure. Of course, at any time a second service-main can be laid under the footpath on the opposite side of the street.

The depths at which gas-pipes should be laid is another problem about which there has been much disagreement between road authorities and gas engineers; and that disagreement has in some Acts of Parliament placed upon gas undertakings an obligation as to depth which is, given suitable subsoil, unnecessary, and which imposes additional cost. It is, as Mr. Lacey points out, an altogether false assumption that the greater the depth of a main, the greater its security from damage through vibration or other cause; and yet it is on such hypothesis that harm to economy has been done in some of the pipe-laying legislation of recent years. The usual practice is to lay pipes 2 ft. 6 in. under carriage ways, and 2 ft. under footpaths; and nothing more is necessary—in fact, if vibration and stress were the only things to be considered, and not the fall of the service-pipes, so much as 2 ft. under footpaths would not be required. Under carriage ways, experience all over the country proves that it is not depth but the solidity and uniformity of the bed on which the mains lie which are the most potent factors in maintaining the stability of mains under the adverse influences to which they are exposed. Of course, in times of peace there is nothing better than subways for maintaining the integrity of any gas distribution system; but it is past being questionable whether, when cost is considered, so far as gas-mains are concerned, there is sufficient justification for subways—other than perhaps at highly important traffic centres. Certain it is that in times of war, under the modern conditions of attack from the air with torpedo bombs, subways are a source of anxiety and grave risk. This will be seen in the paper and in supplementary remarks by Mr. Lacey. Anyway, subways can now only be considered in new roads; to attempt to remove established systems into such subterranean habitations would involve an expense which the author describes as "prohibitive"—a term which could be strengthened many fold.

On another point, we also thoroughly agree with Mr. Lacey. It is that in the case of schemes of road reconstruction or widening, when the positions of gas-mains have to be changed, the cost of doing this should be regarded by the road authorities as an incidental charge upon the scheme; they should not expect the gas suppliers, and through them the consumers, to bear the expense, which would be additional to the original capital outlay. Such an imposition would be totally unjust. Moreover, gas undertakings have, as large ratepayers, to pay a full share of the costs of public improvements without being mulcted in special charges for work involved in connection with their property, which is, under existing conditions, rendering efficient service. This was pointed out by us when recently commenting on the Brentford inquiry, on which occasion the Hertfordshire County Council and certain railway companies sought an amendment of the works clause relating to the altering and relaying of gas-mains when road and bridge improvements were being carried out.

One other matter—and it is an important one—arose in the discussion on the paper. Mr. B. R. Parkinson set it moving. He is a strong believer in steel mains owing to their resilient and resisting powers, and their freedom from leakages. But the question as to relative suitability of these and cast-iron mains and wrought-iron service-pipes is one which is highly controversial among engineers who can point to the wonderful longevity of the mains and pipes to which they have been accustomed. Nevertheless, relative advantages and disadvantages have to be considered. They are in the balance at the present time; and they have to be weighed with due allowance for the circumstances of proposed use.

In Mr. Lacey's paper, there was much in small compass; but it was just sufficient to drive home the facts that there are generally two sides to every question and problem, and that in matters where two or more authorities are concerned in one set of conditions, it is necessary to examine the matter not only from one's own point of view, but from that of the others interested.

Gas Coke Supplies and Use.

THERE appears to be a total misconception in the minds of some people as to the present position of gas coke in this country. Gas coke has greatly improved in quality since the war; and the demand for it comes from a larger area now than was the case before the London Coke Sales Committee came into being, and their enterprise and the missionary work of their energetic Engineer and Fuel Expert (Mr. E. W. L. Nicol) began to have effect. At the recent Road Traffic Conference, Admiral Sir Edmond J. W. Slade discussed the question of fuel resources and supplies for road transport. In his consideration of home resources, he said the most effective and promising substitute at the moment is benzole; but the production must always be limited by the demand for other derivatives—chiefly coke. This is true so far as the metallurgical coke industry is concerned; but, of course, so far as the gas industry goes, it is the demand for gas that sets the quantitative bounds to all other products from the carbonization of coal. In later remarks the author was apparently referring to low-temperature carbonization, when he mentioned that, "though there were numerous retorts working, it did not seem as if the industry was yet out of the experimental stage, in so far as the production of commercial motor fuel was concerned." We are still in the experimental stage in respect of low-temperature carbonization; and although the Unemployed Grants Committee are taking part in the financing of new plant, there is nothing positive available to encourage high hopes as to greater commercial results being realized. Dr. W. R. Ormandy, with all his investigation of the subject, cannot raise any enthusiasm in his own mind as to ultimate success. The few gallons of motor spirit realizable per ton of coal are incapable of stirring him into any active appreciation of a golden future for the process. The capital expenditure per ton of coal treated is an active agent in removing from the prospect all hope of obtaining the liquid fuel required on commercial terms; and a careful scrutiny does not reveal the existence of a market for getting rid of the coke at a price equal to, if not somewhat in excess of, that of coal. All this is not encouraging. It is the same tale that has been told for many years; and the years as they pass only accentuate it. Yet there are a few persistent believers. The men, however, who have believed in the commercial value of the process *per se* have been many. They have formed a constant stream; but as sure as they have entered it, so sure have they passed from it, and have never again associated themselves with it.

There is the question of gas coke. In the discussion on the paper, Mr. Nicol showed the author that the production of benzole is not limited by the demand for coke, inasmuch as there is an acute shortage of the latter at the present time. In other words, the supply is inadequate for the demand. Electric power stations are very large users to-day; and so are several other industrial establishments. This year's demand for gas coke for export up to the end of October was only short by some 18,000 tons of 1 million tons, so that by the end of December we fully expect that export will alone have absorbed 1¼ million tons of the industry's production this year. If all the steam vehicles using solid fuel consumed coke, there could be a really good contribution to benzole production—providing, of course, it paid gas suppliers better to extract benzole than to leave it in the gas. At the present time there are (we believe Mr. Nicol would confirm this if necessary) some 16,000 steam-wagons in use in this country, consuming over 800,000 tons of solid fuel. If coke alone were used for this purpose, an additional 4 million gallons of benzole could be made available. It is a case of the creation of demand for one commodity influencing the supply of another valuable one.

The fact that gas coke is selling so freely now shows that it is not nearly so bad as it is painted—when properly used. There is no disputing the fact that in some gas-works there is plenty of room for improving the quality of coke, and for a greater attention to the condition in which it is sold. It is remarkable, coke being responsible for such a considerable part of the revenue of gas undertakings, that a more universal study is not made of the conditions of its production. There has been some correspondence in the "Financial Times" on the subject of the use of coke in relation to smoke abatement; and almost invariably the writers speak disparagingly of gas coke and praise the low-temperature variety. This, of course, is opposition propaganda, carried on in face of the demand for gas coke, and the efficiencies realizable by it as attested by such well-known experts as Mr. David Brownlie and Mr. Nicol. The former knows of the disadvantages as well as the advantages of gas coke; but he admits that in the open household fire, gas coke is a very efficient fuel, giving 30 or 32 p.ct. efficiency, compared with the 22 p.ct. given by semi-bituminous coal. Also as an industrial boiler fuel, dry coke evaporates 9·5 lbs. of water per pound of coke. This, of course, must be with gas coke of decent quality, used as it should be. The figures are striking, and particularly the one as to steam-raising. Yet the 9·5 lbs. is recorded daily as an average evaporation by several of the leading public utility authorities. That they have at length been brought to see the advantage of gas coke as a boiler fuel has only been due to the persistent propaganda of the London Coke Committee and of their Engineer and Fuel Expert. We have yet to learn whether low-temperature coke would behave similarly in steam-raising; but, as Mr. Nicol has pointed out, the fuel cost per 1000 gallons evaporated would necessarily be higher, owing to the fact that low-temperature coke is a relatively expensive primary product.

In several gas-works now, by inclined quenching tables and other means, the moisture content of coke is being reduced. This is important; but it is a pity that in transport care is not taken to protect it from rain. Moisture in coke naturally reduces its evaporative or radiant efficiency. If all coke could claim to be the same as one to which Mr. Nicol calls attention in his letter to our financial contemporary, there would not be much of which to complain. One of the largest Metropolitan public utilities, he says, purchases coke for steam-raising upon a strict thermal basis; and its official analyses give the average moisture content over a period of many months as 1·7 p.ct. While this is the actual official report, Mr. Nicol is wise in not accepting it, or putting it forward, as a representative figure for gas coke generally.

It has become a habit with some people to disparage gas coke; but their efforts in this direction are being heavily countered by those who have had experience of the merits of, and the realizable efficiencies from, the fuel when properly used. Such experience is extending; hence the reason for the supply of coke in some areas being inadequate to the demand. That is a comfortable position for any commodity to be in. However large the output of coke, we can wish for it no better condition than that the demand may be always slightly in excess.

Statutory History of Gas Quality.

IT is an excellent thing to have the memory occasionally refreshed regarding the history of matters in which one is daily concerned; and those so concerned who have not lived through the time the essential part of the history has been in the making should see to it that they become acquainted with its general details. In regard to the quality, composition, and testing of town gas, Mr. Harold E. Bloor, of York, rendered inestimable service in preparing the historical record of their evolution which he presented at the Public Works, Roads, and Transport Congress, and an abstract of which was published by us last week.

It will be seen from the paper that, in respect of the subjects referred to, the present position has not been reached in any haphazard way. It has been pure evolution; but the way of it has been blocked by many barriers, which the industry has had to cut through either by active work or by patient wearing-down. But what a different state of things in regard to quality exists to-day, compared with even two or three decades ago. To obtain justice for the industry in this relation has been a persistent fight; and sometimes the contest has been very acute. But singular to say the greatest transformation in it, after all the struggling and resistance that had gone before, was presented to the industry through enlightened agency without even asking for it. As Mr. Bloor's admirable account of this particular part of the history of the industry is perused, it must strike the reader as a remarkable commentary on the workings of the human mind. Here what is set forth in the paper shows that it has been a tradition with our Legislature that, in the matter of gas quality, the proper thing in the interests of the consumers of gas is to fetter and restrict gas undertakings, and make them work to inflexible regulations. It never dawned upon minds which were supposed to be trained diplomatically and to be of constructive and

judicial bent that any tethering which limited action might in fact be highly prejudicial to the consumers, and that by other ways and means much more of benefit could be made to accrue to the public and national advantage. It remained for a body of advisers to show Parliament the error of their ways in this respect, and to suggest to them that liberty to the industry, with even better protection to the consumers than hitherto obtained, would be a public and economic advantage. When the Legislature accepted that sage counsel, and gave the industry the Gas Regulation Act, it was the wisest thing they ever did in relation to gas quality and testing.

In this connection, the name of Sir George Beilby must always remain inscribed boldly and with veneration in the annals of the industry. And this reminds us that there is only one fault we have to find with Mr. Bloor's narrative of the history of the evolution of statutory gas quality and testing; that is, he did not prominently place on record the names of those stalwarts who did so much, both offensively and defensively, to contribute to the evolution of things which gradually led to the change from standard illuminating power to standard calorific value, though not so far as the liberty of each undertaking to declare the calorific value best suited to its economic circumstances, and to charge for the gas on the basis of thermal value. The vision of those leaders (knowing the ways of our Legislature) had never compassed such a possibility. However, we remember long years since, when questions affecting standards of quality were before Parliament, the work in the Committee rooms of Livesey, Woodall, Carpenter, Hunt, Jones, and many others. They may have been fighting at different times for proposals contained in the Bills of individual undertakings, but all the same they were working for the whole industry and for its greater liberty; they were paving the long road to an end which they then never thought possible, but which end we are to-day enjoying through the (for an industry that had operated under so much restriction) remarkable ordinance of 1920.

We are of opinion that Mr. Bloor's paper will be frequently consulted by those who desire in concise form the history of statutory gas quality and testing; and the dates he gives stage by stage will direct those who require them to the fuller but scattered records that are to be found in the big history of these things provided by the volumes of the "JOURNAL."

Amalgamation of Gas Organizations.

A gas engineer, writing from the United States on the subject of our recent editorial comments regarding the American Gas Association meeting, says the fusion of the gas organizations in that country has produced splendid results. He feels that similar amalgamation is bound to come in course of time in the British Isles; but, he adds, "every day of delay is so much lost time."

South London Subsidence and Explosion.

At the Ministry of Transport inquiry into the cause of the accident in Newington Causeway, on the City and South London Railway, gas was entirely exculpated. As pointed out last week, a subsidence was the cause of the whole trouble, and the consequent removal of support from the gas-main resulted in its fracture. But how the escaping gas became ignited remains a mystery. Nobody knows positively; and nobody appears to have publicly advanced any theory. The matter can remain there. A satisfaction is that everything has now been done to reassure the public as to the safety of the tube railways, and the incapability of gas-mains "exploding." The latter do not carry in them an explosive mixture; and gaseous explosive mixtures require some means of ignition before an explosion occurs.

Confidence.

The Worthing Town Council have shown a large measure of confidence in one of their members. The Electricity Committee were desirous of making Mr. W. E. Wenban Smith their Chairman; but he was a shareholder in the Gas Company. Whether this was taken as testimony to his good judgment cannot be said. Anyway, the Town Clerk reported on the legal position; and the Committee came to the conclusion that he was not disqualified from being their Chairman. But Mr. Wenban Smith would not accept the position until the Council had endorsed his election. This they did yesterday week—twenty-two votes being cast in favour, and only two against, while one member did not record a vote. Due tribute, the report states, was paid to the integrity and high honour of Mr. Wenban Smith. So the Electricity Committee have got as Chairman the man of their choice.

Tar Spraying and Slippery Roads.

Lord Mildmay, as President of the Hunters' Improvement and National Light Horse Breeding Society, has recently addressed a letter to county councils throughout the country calling attention to the numerous accidents, in many cases fatal, which have resulted from the slippery condition of roads. He agrees that the surfaces of roads must of necessity be waterproofed; but there is the difficulty of providing a proper foothold on such surfaces. A remedy is highly desirable; and he refers to the beneficial results that have accrued from the treatment applied to certain roads in Warwickshire through the use after tar-spraying of a larger size of grit, spread in a thicker layer than is at present customary. He says that this not only provides a better foothold for horses, but the life of the road is materially extended.

Sulphate of Ammonia.

The exports of sulphate of ammonia in October amounted to 26,587 tons; and in October, 1922, to 9659 tons. In the ten months this year, the quantity totalled 211,593 tons, compared with 113,280 tons in the corresponding period of last year.

An Upward Tendency.

There appears to be a little upward tendency in the prices of most structural and manufacturing materials. At any rate, comparative tables published by the "Iron and Coal Trades Review" indicate this. Take a few examples. On Nov. 22, Cleveland pig iron was quoted at £5 per ton, compared with £4 12s. 6d. on Nov. 23, 1922. Scotch pig iron was quoted at £5 5s., as against £4 15s. 6d. As to finished iron and steel, South Staffordshire marked bars were quoted at £14 10s.—£1 higher than a year ago. The other items under the same heading all appear to show something like 15s. to £1 rise. Copper for cash, at £60 12s. 6d., is about 30s. down; but tin at £223, compares with £174 10s. a year ago. Durham gas coal was quoted on Nov. 22 at £1 4s., which is a reduction on the prices that have ruled this year, but only 9d. less than on Nov. 23, 1922. Furnace coke, delivered at £1 18s., is about 8s. 6d. more than a year ago; while foundry coke, at £2 2s. 6d. f.o.b. Newcastle, is up about 12s.

Effects of the Importation of Steel.

In a pamphlet entitled "The Folly of Unrestricted Steel Imports and Its Influence upon Unemployment," Mr. Benjamin Talbot arrests attention with the following striking figures to illustrate the effect of importing 1,000,000 tons of steel instead of making it ourselves. A million tons is the actual amount imported during the first nine months of this year. Had this been manufactured here, the following raw materials would have been used: 3,000,000 tons of coal; 1,232,000 tons of British ironstone; 750,000 tons of foreign ore; and 600,000 tons of limestone. In addition, we should have manufactured: 1,000,000 tons of coke; 18,000 tons of sulphate of ammonia; 30,000 tons of pitch; 30,000 tons of creosote, anthracene, &c.; 100,000 tons of basic slag; and 2,500,000 gallons of benzole, as well as large quantities of bricks, rolls, machinery, and stores of all descriptions. At least 6,000,000 tons more traffic would have been carried by our railways; and relief given to our rates and taxes, as 50,000 more men would have received employment instead of being supported in monotonous idleness.

Southern Association of Gas Engineers and Managers (Eastern District).—The next meeting of the Eastern District of the Association will take place at 2.30 on the 19th inst., at the Institution of Gas Engineers, No. 28, Grosvenor Gardens, S.W.

The Care of the Piano.—Frequently pianos are perforce placed in rooms only occasionally occupied and warmed, and instruments are often ruined for the lack of a few simple precautions. A number of practical suggestions for overcoming this difficulty are to be found in the "Care of the Piano" issue (No. 117) of "A Thousand-and-One Uses for Gas." This publication contains illustrations of various makes of pianos in drawing rooms, schools of music, lesson rooms, pianoforte showrooms, and professional artistes' studios, which show the methods adopted for keeping the instruments in good condition. Other articles and illustrations deal with the care of valuable paintings and leather-bound books.

PERSONAL.

Sir GEORGE BEILBY and Prof. ARTHUR SMITHELLS have been elected members of the Royal Institution.

The many friends of Mr. LEWIS SHAW, Gas Manager, Rothwell, Leeds, will be sorry to hear of his removal to a nursing home to undergo an operation. We are, however, pleased to be able to state that the operation was successful, and that Mr. Shaw is progressing as satisfactorily as can be expected.

At a meeting of the Institution of Civil Engineers on the 4th inst., Mr. F. C. BRIGGS, of Dudley, and Mr. F. G. GORMAN, of Lower Sydenham, were elected associate members.

Last week's General Election involved a great many personal changes; but a glance through the lists does not reveal the names of many men connected with the gas industry as having been engaged in the contest. Sir J. BRUNNER, a Director of Messrs. Brunner, Mond, & Co., gained a seat for the Liberals at Southport. Mr. REGINALD G. CLARRY, who retains Newport (Mon.) for the Unionists, is a son of Mr. George Clarry, of Cardiff, and was formerly Engineer and Secretary of the Swansea Gas Company. Sir W. H. COWAN, returned as a Unionist at North Islington, is a Director of Messrs. Parkinson and W. & B. Cowan. Sir JAMES F. REMNANT, Bart., as a Unionist, still represents Holborn. Mr. E. D. SIMON, who is known to the industry through his interest in smoke abatement, secured a Liberal gain in Manchester. Among the successful Labour candidates are Messrs. WILL THORNE, J. O'GRADY, J. R. CLYNES, and A. HAYDAY, all of whom are associated with trades union organizations concerned with the gas industry. On the other hand, Lieut.-Col. H. K. STEPHENSON failed to retain for the Liberals the Park Division of Sheffield; and Sir ALFRED MOND lost his seat as a Liberal for the West Division of Swansea.

Mr. GEORGE DEIGHTON, Works Superintendent to the Harrogate Gas Company, has been presented with a solid silver tea service, the gift of the Directors, in recognition of his completion of fifty years' service with the undertaking. His brother, Mr. WILLIAM DEIGHTON, who is Distribution Superintendent, was the recipient of a similar presentation eleven years ago, having now been with the Company for 61 years. Their sister Mary has been forty years with the concern; and their father, who was general foreman, completed 62 years in the Company's service. Of the third generation of the family, one has 19 years' service already, and the other 14 years. The three generations, therefore, have a total record of 246 years' service with the Company, or an average of 41 years for each of the six.

ELECTRICITY SUPPLY MEMORANDA.

As President of the Scottish Centre of the Institution of Electrical Engineers, Mr. R. B. Mitchell, of Glasgow, has recently delivered his Inaugural Address. It was a heartening deliverance, or was intended to be, for those who are in less affluent places than Glasgow for the obtaining of fresh business. Electrical men have their eyes on a greater domestic connection; and they dream of this coming to them in the future. None of us know what the future has in store; but, whatever its nature, it is good in the present to be hopeful and optimistic. At the same time, the hopefulness and optimism should be based on existing conditions, and something might be allowed for anticipated improvements. But what is there in the circumstances of electricity that has not been present for years which places its purveyors in a better position to-day than formerly for possessing enlarged hope regarding domestic electrification. Wiring is still expensive—more so than before the war. Appliances are costly—more so than before the war. There can be no genuine expectation of a greater thermal efficiency in regard to those appliances; for in electric fires and cooker ovens the maximum has already been reached. Where 100 p.ct. efficiency exists (some of it in imagination, and not in fact, which we know to be the case), there cannot be any more gain. A unit of electricity now, as before, is capable of developing 3420 B.Th.U.—nothing more. Improved efficiency in generation may make a little difference to production expenses, but now only by a fraction of a penny. Coal costs more, and so does generating plant, than before the war. Therefore the price at which current can be sold at a "profit" for intermittent domestic heating purposes does not appear likely to descend to any appreciable extent. Thus the basis of hopefulness does not present itself in any very prominent form. But men have to say something, and that of a palatable character, when preparing presidential addresses. Anything of a contrary nature would be very unpopular. However, Mr. Mitchell says: "If the experience in Glasgow reflects that of other undertakings, then those engaged in the business of electricity supply will require to set their houses in order, so that, when this flowing tide sets in, it may be adequately coped with." It will be remarked that the presidential thoughts are in the future; that no time can be fixed as to "when" the flowing tide will set in.

In the Future.

Complication to Serve Electricity.

However, it also appears that the flowing tide is not going to set in without some impetus external to itself. "Engineers," Mr. Mitchell says, "must not be content simply to wait for better times, but must go out for the stimulation of the use of all appliances which will consume energy during the hours of light load. Despite all the drawbacks of electricity as a giver of heat in comparison with other heating agents which render prompt service as and when required, and at a lower cost per unit of water heated, Mr. Mitchell is convinced that there is good business to be done in the heating of domestic water supply and the storage of heat in business premises during the night for use next day. It is a study to follow the roamings of the electrical mind as to what people are prepared to do, in complicating their conditions of life and their household equipment, in order to serve the interests of electricity supply. "Electrical Industries" obviously does not think Mr. Mitchell has allowed his mind to roam far enough in this matter; for it says that he "does not specifically mention room heating on the storage principle, although more than one heating engineer is giving very close attention to the possibilities of the electric hot box." From the practical business man's point of view—that of the man with large experience of what the public will do to meet their needs—it is all very humorous. One of the things the public will not do is to depart from simplicity and economy in their methods of operation, if the result is to be complication, uneconomy, and less satisfaction. However, Mr. Mitchell's faith is great in being able to turn human habits and desires topsy-turvy. For water heating, he says, special low rates could be given; and the "only" difficulty to be overcome is cutting-off the current during the restricted period. Will the public put up with the curtailment of any requirement, and simultaneously secure less economy in time and money, and an abbreviation of household convenience? There is a delightful rustic simplicity about all these views of our electrical friends.

Present Solutions of Certain Problems.

It will be seen that it is all in the future that these things are to develop. They may come about in limited degree. Some people will have anything and pay for anything if there is novelty in it, or if it is something that their friends have not got. But such people do not constitute the majority. There are a few hundred people with electric cookers in thickly populated Glasgow. Thousands upon thousands of gas-cooking appliances are in use; and the numbers are increasing. Mr. Mitchell states that experience in Glasgow shows that consumers who have added cooking and heating to lighting have multiplied revenue five or six times. We have not the slightest doubt as to the truth of this; and yet the charge for cooking and heating is so far removed from the charge for lighting. Only one phase of the potentiality of gas is disclosed by the fact that in its case cooking and heating are at present usually charged at the same rate as lighting. However, Mr. Mitchell looks forward to the general adoption of two-part tariffs; and he advises that the running charge be made as low as possible, even at the expense of the fixed charge. Why? Because "consumers naturally think in terms of the running charge; and the lower this is, the more inclined they are to use electricity freely." Well, if they only think in terms of the running charge, they must be foolish; but in the gas industry, we do not come across many consumers of this type, as apparently is the case with our electrical competitors. The President also thinks that hiring-out the more costly apparatus is necessary; his experience is that, even in the case of fires which can be bought at moderate prices, people prefer to hire them. The problem of the unwired house is still unsolved. In Glasgow only 14,000 out of 250,000 dwellings are wired; the balance being occupied by people who will not wire for the landlord's benefit—not even to secure restricted use of energy for hot water supply, and the hot-box system of room heating. The only solution Mr. Mitchell can offer is wiring on hire or hire-purchase terms. "Electrical Industries," on the other hand, admits that the history of "free" wiring has not been a particularly happy one; but it does not think this is a reason for turning-down the proposition. "The risks encountered are well defined, and will therefore suggest their own safeguards." Why have they not done so before?

"Safety First."

The British Industrial "Safety First" Association can correctly claim to have achieved a considerable success through their activities, which were organized on a national basis in 1918. The results show the soundness of the principles they laid down, have advocated, and of which they have secured a considerable adoption. The Association believe in education in this matter, and in carrying it right back to schooldays. There is nothing like starting at the right place, and making such things as carefulness part of the life and habits of a person. The results of the work already accomplished prove that there is more than assumption in the advantages of this, and that, by inculcation of the principles of safety first among the young, the progressively good results so far attained will with time further improve their rate of increase. Those industrial firms who have applied the new methods have experienced a reduction of fatalities and of personal injuries, and a saving of time and money. These are important considerations; and they are valuable aids

to works efficiency. It is to be regretted that principles which have proved so effective are not more widely practised. We cannot, however, imagine that the results achieved are sufficiently known to employers, or they would surely be eager to realize something similar. They hear of "safety first" methods; and they simply look upon them as the theories of well-meaning folk without much practical experience. When, however, one looks at the records of industrial accidents, it does not require further evidence to induce an opinion that there is a vast field for improved methods in our factories. But to-day there is much incorporated in factories about which many employers and employees know very little. For instance, there is electrical operation. In his annual report Mr. Scott Ram, as Chief Electrical Inspector of Factories, proves this; and in such directions one wonders if the electrical industry itself is doing all possible to assist in the promotion of safety. The reports show that there is a considerable amount of indifferent installation, and a lamentable lack of knowledge by the users. The results of these conditions alone should suffice for efforts to be made to bring about an improvement. But on the general question, we read that one prominent electrical and manufacturing company in the Midlands states that, since "safety first" work was organized in their factories in 1913, the cost of compensation per £100 of wages has fallen from 9s. 11½d. to 2s. 10d. The same tale comes from other industries and factories.

Unavoidable Troubles.

In connection with electricity, there are occurrences over which employers have no possible control. There are, for example, what are called "latent" defects, which sometimes cause death. For instance, recently a man named Frost was electrocuted while driving an electrically operated ram at the Wigan Coal and Iron Company's coke-ovens at Kirkless. The deceased was found with his left hand clutching an electric lamp and his right hand the handrail; his left hand being fastened with the lampholder, and in direct contact with his feet and right hand—his feet being on the plate. One of the lamp wires was "drawn," and had made contact with the lampholder. The evidence given at the inquest led the Coroner to find there was a defect, but that it was latent, and was not one for which the Company could be held responsible. "Death from misadventure" was recorded. Then there are the interruptions of work arising from failures of the electric supply. These do not occasion physical damage to the workers; but they sometimes affect both their pockets and those of the employers. They cause loss of time and output. We referred to some of these failures a fortnight ago; and there have been others since. For example, there was one on the 3rd inst. in industrial West Ham, through a short circuit at the generating station, when two or three men were somewhat badly burned. Another particularly noticeable failure was at Lynton (North Devon). This has no association with industrial accidents; but it points to an unpleasant feature of such occurrences. When the light failed, a farmer's wife, named Perkins, was being operated upon for appendicitis. The appendix had to be removed by the aid of the light of candles. But the wound could not be stitched up properly; and the operation had to be finished next day. The woman died; but at the inquest death was attributed to natural causes.

The Uneconomy of Poor Lighting.

It is unquestionably true that poor or unsuitable lighting in factories and workshops is responsible for accidents and an output lower than the maximum possible. An interesting article on the subject has appeared in the "Electrical Times" from the pen of Mr. C. Sylvester, who is associated with the British Thomson-Houston Company's Lighting Service Department. He asserts that bad lighting is a prolific source of accidents, and ascribes this in the first place to praiseworthy, but ill-advised, attempts to better the plant illumination on the basis of providing high candle-power units improperly fitted as regards height and spacing. He finds what other students of this subject have found, that the questions of distribution, diffusion, and absence of glare are not considered or appreciated. Open-type arc lamps are still used in some large industrial works; and they ought not to be. Good work cannot be carried on under illumination from arc lamps. Whose fault is it that solecisms of the kind are perpetrated? And whose fault is it, too, that the lighting of machine shops is often treated in the same manner as boiler shops and foundries? It is also considered that what is good enough for these shops will be satisfactory for drop forging shops and saw-mills. Of course, every shop and every process requires different lighting treatment to obtain the most suitable results. To excuse bad lighting on the ground of economy is foolish. Bad lighting is the direct cause of uneconomy. We are strong in our advocacy of works economy, but never if it affects profitable efficiency, and we use the word "profitable" deliberately. A single accident through bad lighting may cost a sum that would pay the account for adequate lighting for some time. One irregularity is to have a strong light on work, and dark shadows about the place. The worker who is operating at his bench or machine in a good light has his eyes attuned to it; but if he suddenly steps away into darkness, he is at a worse disadvantage than if he had been operating with a poor light. Another point is suggested by a perusal of Mr. Sylvester's article is that many workers do not realize that their unusual fatigue comes from glare or light reflection. When this sort of thing happens, and workers complain that they "cannot see very well," the untutored in these matters attempt to amend the conditions, but really make them much worse, by changing the lamp for a larger unit, while an adjustment of the existing local light to change the angle of incidence or reflected rays is probably all that is required. The important question appears in the article, What constitutes good lighting? In the summer at times the sun's rays are too intense; and this is an example of unlimited and uncontrolled light. Experts, as Mr. Sylvester points out, now concede that ideal illumination occurs on a cloudy day, when the light from the sun must pass through a screen of vapour and clouds before reaching us; and therefore it would appear that Nature herself is at her best when supplying a semi-direct form of lighting. It is clear that the author of the article is rather inclined to go into the region of super-refinement. To his mind, not only must illumination be uniform in diffusion and intensity on adjacent walls as well as on working areas, but the light must be of the proper colour to suit the purpose for which it is employed. We can, at any rate, fully agree with the greater part of what he says, including the sentence: "Correct lighting for all conditions of industry is a sure shield against accidents." That is the point. A study should be made of conditions and requirements, and of the necessary protection against the harmful effects of glare. But some electrical contractors hesitate to give advice which may add somewhat to the initial cost of installation, fearing that this would lose them the job in competition with other lighting agents. Their persuasive powers are apparently not equal to showing factory owners who desire to improve their lighting that additional initial expense in the long run is a profitable investment.

Voltage, Lumens, and Lamp Life.

In "Electrical Industries" recently, an article appeared by Mr. W. Millner, of the Lighting Service Department of the Company mentioned in the preceding paragraph. It dealt with the subject of lamp efficiency—showing that with a 10 p.ct. increase in voltage, the lumens are increased by 40 p.ct. He omitted, however, to state the corresponding increase in watts. Mr. B. W. Gothard, the Electrical Engineer of the Aldershot Gas, Water, and District Lighting Company, wrote to our contemporary pointing out this omission, and saying that the relation between voltages and watts would be useful, especially when trying to pacify a consumer who complains that the over-voltage has reduced the life of his lamps. This is the trouble that results from over-running lamp voltage; it is a good thing for the lamp sellers, but not for the lamp users. Mr. Millner has replied to the inquiry to the effect that an increase of 10 p.ct. over the rated voltage of the lamp increases the current consumption by 5 p.ct., and the wattage by 16 p.ct. With a 10 p.ct. increase in voltage, the actual light output of the lamp being raised by 40 p.ct., it is obvious that the increase in light is very much greater than the advance in consumption. He adds that the efficiency, and consequently average life of a lamp which will prove in practice to be most economical to the consumer, depends entirely upon the price of the lamps and the price of the energy. Naturally the lower the prices of the lamps and of the energy, the less the necessity for considering the life of the former. However, Mr. Millner says: "It can be shown that for a 100-watt gasfilled lamp at 6s. and a cost of energy at 6d. per unit, the consumer is getting his light at the most economical rate when the life of the lamp is about 725 hours." Gasfilled lamps do not always survive that period of use, even when run at the rated voltage.

NEW HOLDER AT ST. BLAZEY.

To cope with the increased demand on their works, the St. Blazey (Cornwall) Gas Company have erected a new gasholder at Par Docks, Par, which was formally opened last week by Mrs. N. E. Purcell, wife of the Chairman of the Company. There was a large gathering, including shareholders of the Company and Directors and representatives of several Cornish gas undertakings. The holder is a two-lift one. The foundations were laid by Mr. Alderman, of Par, and the work itself carried out by Messrs. Willey & Co., of Exeter.

Mr. Frank Nettle (the Secretary of the Company) said that in 1892, when the works were established, the output was between 50,000 and 60,000 c.ft. per annum. The output by 1910 had increased to 1½ millions, and at present it was 12 million c.ft. Mr. H. E. Riley (Consulting Engineer, and Managing Director of the St. Austell Gas Company) pointed out that, with the new holder, the Company would be able to store 72,000 c.ft. of gas—the daily consumption being 60,000 c.ft.

Mrs. Purcell performed the opening ceremony by opening the valve leading to the main. Subsequently the Gas Company entertained those present, when Mr. Davies moved a hearty vote of thanks (which was seconded by Mr. Job) to Mrs. Purcell. He hoped it was a good augury for the future of the Company. Mr. Purcell, who replied on behalf of his wife, referred to the very satisfactory way in which the work had been carried out by Messrs. Willey & Co.; and Mr. J. H. Rew (their representative), on behalf of the firm, presented Mrs. Purcell with a silver epergne as a souvenir of the occasion.

Mr. H. H. Hoare (the Engineer and Manager of the Falmouth Gas Company) congratulated the St. Blazey Company on their progress. The shareholders should be pleased with the position.

REVISIONS IN PRICE UNDER SECTION 1 OF THE GAS REGULATION ACT.

By GEORGE EVETTS, M.Inst.C.E.

The recent inquiry into the revision of the Standard Price of the Gas Light and Coke Company (granted under section 1 of the Gas Regulation Act, in the early part of 1921) has cleared up many matters which have hitherto involved doubt and discussion, particularly among those interested in the question of early revision.

Having regard to the procedure at the inquiry referred to, in conjunction with the rules issued by the Board of Trade, the following are the material factors to which attention may be usefully directed:

(1) The reduction in the standard or maximum price will be calculated from a direct addition to the original standard existing in pre-war days.
(2) The question of dividend will be one of the least important considerations in the assessment of the revised price.
(3) The pre-war cost per therm is definitely established in normal cases.
(4) Little variation in the present cost per therm will be probable between the local authorities and the gas companies when the former are advised by a reasonable and competent person.
(5) It will be sufficient for the promoters or applicants for revision to prove a substantial reduction in the costs of production, without necessarily suggesting in the application the revised price.
(6) It will be desirable for gas companies to give their opponents all reasonable information of current prices, if the applicants wish to estimate a figure for the revised price.
(7) A reasonable local authority will agree that the savings due to good management and efficiency, which may have matured since the original order was granted, should be taken into account, and credited to the gas undertaking; but the onus of proof of such savings will be on the gas undertakings.

REDUCTION IN STANDARD PRICE.

With regard to item 1, the writer, in an earlier contribution on the subject of revision, ventured the opinion that the reduction in costs since the date of the original Order would be calculated by inference; and this was the method adopted in the calculations made by the County Council and the Gas Company in the Gas Light and Coke Company's case. Taking the figures of the Company, they state that the present cost of gas has increased by 3·4d. per therm since June, 1914, and consequently the original 3s. 2d. per 1000 c.ft. (7·6d. per therm) should now become 11d. per therm (the balance which makes the figure up to 11·4d. being the result of economies effected). Therefore the present standard price of 15·2d. per therm should be reduced by 4·2d. on account of reduction of cost, but only by 3·8d. when taking the economies into account. This 3·8d., however, is not arrived at by making a calculation of the cost of gas in 1921, since it is assumed that the figure of 15·2d. in 1921 is a correct one, having regard to the calculations of the Board of Trade at that period. It is clearly impossible for the County Council or the Gas Light and Coke Company to know the many factors which were taken into account when fixing that price, since costs were widely fluctuating at the time, and calorific value was uncertain. They do not know the adjustments made by the Board of Trade in the various items comprising the estimated cost of gas. Thus the short cut from 1914 achieves the purpose of the revision clause without a laborious comparison of each item of cost in the schedule between 1921 and to-day.

Assuming the cost of gas in 1921 was more or less clear-cut, it does not follow that these costs were accepted when the Board of Trade made the calculation for the first therm price, because the Board could only allow such a part of the increase as was outside the control of the undertakers. Therefore the revised price would not necessarily be calculated by the actual difference in cost of production since 1921, as a typical case (referred to later) shows.

THE QUESTION OF DIVIDEND.

Dealing with point No. 2, it has been frequent for gas companies' opponents to criticize a proposed price under section 1 purely on the basis of the dividend which would be authorized by the granting of this price, coupled with the selling price of gas at the time of the application, without reference to the merits and circumstances of the case. Though it was the intention of the Gas Regulation Act to restore the pre-war position, there is nothing in this Act to prevent a higher dividend than pre-war. In fact, the wording of the specific clause is so wide as to give the Board of Trade power to recognize any special circumstances which may result in the dividend being more or less than pre-war. In a badly managed company, the effect of an Order under section 1 may result in a lower dividend than pre-war; and there is nothing surprising in this.

The application of the dividend basis of assessment is only rational when such factors as output, capital, production, and plant are unchanged since 1914. It is interesting, therefore, to note that in the Gas Light and Coke Company's case the figures of costs were dealt with strictly on their merits, and tested by the dividend calculation merely as a passing reference to show that there would be no serious hardship involved if the Council's figure of 10·8d. were granted. The dividend test will fail when applied to many companies whose selling price has been reduced by an amount more than that due to the falling costs of materials and labour. Take Hornsey as a marked example. Their present selling price is 8d. per therm, and in pre-war days the dividend on the 7 p.ct. stock was 10 p.ct. (including the contribution to the reserve fund). This is equal to twelve increments of dividend. Therefore, on the dividend basis, the Hornsey standard price should be 8d. *plus* 12 times 0·2 = 10·4d. per therm. The pre-war standard was 3s. 9d. = 9d. per therm, and by the above figures it would appear that the cost of gas in Hornsey has only increased by 1·4d. per therm. The reasons for this small increase, as compared with the pre-war figure, are probably due to efficient buying, carbonizing, and management, and a lower dividend demand; and these factors would have resulted in a lower price and higher dividend without any change in the cost of materials and labour. It is only fair that the shareholders should get some recognition of this fact; otherwise, the Hornsey Company would obtain under revision a price at least 0·8d. per therm less than the Gas Light and Coke, as compared with the pre-war 1·4d. in excess (viz., 3s. 9d. against 3s. 2d.) or a change-over of at least 2·2d. per therm. It is clear, therefore, that the dividend basis is of little or no value in calculating the standard price.

PRE-WAR COST OF GAS.

With regard to the pre-war cost of gas per therm, no fresh investigation is required; the cost for the year to June, 1914, is taken as the basis, unless anything abnormal occurred, which would be reflected in the average of the three pre-war years, and then the adjustment could be made in exactly the same manner as in the original application.

GAS UNDERTAKINGS AND LOCAL AUTHORITIES.

With regard to item 4, there are many reasons why there should be only slight variations between the calculations of a gas undertaking and a local authority. The most important factor is settled—that of calorific value—and, therefore, the vexed question of the divisor to convert pence per thousand into pence per therm—will no longer arise. In the case of undertakings who do not propose any change in the calorific value, the average of the official tests will presumably represent the divisor for the quality of gas made to-day. It should be noted that the correct divisor will be value supplied, and not value declared, in the same manner as the pre-war cost is divided by the value supplied, and not the value equivalent to the statutory obligation in candles.

In the case of the Gas Light and Coke Company, the matter was somewhat complicated, in view of the alteration in amounts of materials due to the change in calorific value from 475 to 500 B.Th.U. Even with this adjustment there was not a very substantial difference between the net coal costs; and the difference was practically accounted for by the relative estimates of cost of coal of 29s. and 30s. A further point with regard to costs is that prices are now more or less stable. As to the relative figures for coal and residual products, the experience of the last year or two forms a valuable guide. The question of wages is comparatively simple, for the majority of the large companies are in the Federation of Gas Employers; and the present wages can be worked out from the published figures of 1922, with comparative accuracy. For repairs, the Gas Light and Coke Company accepted an overall increase of 80 p.ct. over pre-war figures. The writer's opinion is that 80 p.ct. is sufficient for most undertakings for mains, services, meters, stoves, &c., but is not sufficient on the works in cases where contractors are called in to any great extent. If such work as the re-lining of furnaces, re-setting of retorts, &c., is done by the Company, then 80 p.ct. should be sufficient on the works. When this class of work, as well as patching and re-sheeting of gasholders is done by contract, then the figure should be nearer 100 p.ct. increase.

ITEM NO. 5.

There is not much to be said regarding item 5, but it is to be noted that in the case of the Newcastle and Gateshead Company (as well as the Gas Light and Coke Company) the Local Authorities have named the figure to which they think the standard price should be reduced, though there is no obligation to do so. In connection with the applications for Amending Orders, Rule 4 states: "Applications for an Amending Order shall be accompanied by the following documents," of which "A" reads as follows:

> "A statement in duplicate showing by reference in detail to the published accounts of the undertakers the alterations in the cost of production and supply of gas by the undertakers upon which the application is founded."

It is clear that this statement need not necessarily reduce these altered costs to the basis of pence per therm or pence per thousand, and it need not state a suggested revised price. A mere statement (in two parallel columns) of the costs of gas from the revenue account, extracted from the printed accounts of 1920 or 1921 and a more recent issue, would be sufficient to comply with this rule. In connection with this matter, it will be observed that it does not follow that the Board of Trade will hold an inquiry or make an Amending Order merely on the application of any local authority. This should have the effect of preventing the question of revision cropping up too frequently. The revision clause in the 1920 Act states that it has to be shown to the satisfaction of the Board of Trade that the costs have substantially

altered, owing to circumstances beyond the control of the undertakers. Therefore, the mere compliance with Rule 4 would not always justify the Board of Trade's holding an inquiry. If this were not so, we might have to look forward to revision in the future on every occasion on which a substantial reduction in the price of gas were made, and a correspondingly higher dividend paid.

INFORMATION OF CURRENT PRICES.

Little need be added to the remarks under No. 6. A frank disclosure of all current prices of coals, oils, residuals, &c., together with wages and local rates, will simplify the proceedings at the inquiry, without detriment to the gas company's case, if any special consideration should be required regarding any of the points raised. It will also result (as in the Gas Light and Coke Company's case) in bringing the opposing parties very near in the actual result, and in a conciliatory atmosphere, which may foster minor concessions, or at least avoid acrimonious discussion.

EFFICIENT MANAGEMENT.

With regard to item 7, the learned Counsel for the London County Council agreed that the wording of the proviso in section 1 of sub-section 3 appeared to enable the Company to add to the price arrived at on the basis of difference of cost the effect of economies and management which had matured since the date of the original Order. Naturally, he did not admit that the figures put forward by the Gas Light Company had been proved. It is curious to observe that the economies between 1914 and 1921 cannot be fairly claimed in accordance with the first paragraph in sub-section 3—*i.e.*, the price obtained under a first section 1 Order cannot include a figure greater than the established costs, but it may be less. The following typical cases will make this point clear.

Consider three companies who had a pre-war cost of gas of 6d. per therm, and assume that, in each of these cases, gas went up in cost by 8d. per therm between 1914 and 1921, without taking into account the effect of good or bad management—*i.e.*, on the strict basis of materials and labour costs, the increase was 8d. Assume also that since 1921 costs have dropped by 3½d. per therm—again taking only decreases due to falling costs of materials and labour, and neglecting savings due to efficiency.

Therefore, if all these companies were dealt with on the same lines, the present standard or maximum price should be 4½d.—*i.e.*, 8d. less 3½d.—in excess of 1914.

Assume that these three companies effected savings in the following manner:

Company "A."—1½d. per therm has been saved, all of which occurred during the period 1914-21.
Company "B."—1½d. per therm, all of which occurred between 1921 and 1923.
Company "C."—1½d. saved in all, of which ½d. was between 1914 and 1921, and 1d. between 1921 and 1923.

The following table shows the various stages of progress of the companies under the Gas Regulation Act, assuming that the revised price is adjusted from the first price obtained under section 1, and that economies are taken into account.

	Pence per Therm.		
	(A)	(B)	(C)
Cost of gas in 1914	6	6	6
Cost of gas in 1921, had no economies been effected	14	14	14
Actual cost of gas in 1921	12½	14	13½
Increase granted under first section 1 Order	6½	8	7½
Cost of gas in 1923, neglecting savings	9	10½	10
Actual cost of gas in 1923	9	9	9
Price which would be granted under revision, expressed as an increase to the standard or maximum price over 1914	3	4½	4
= Original increase − reductions outside control of undertakers since 1921	= 6½ − 3½	= 8 − 3½	= 7½ − 3½

It will be seen that here are three identical companies, in so far as all started in 1914 with gas costing 6d., and ended up with gas costing 9d. This amounts to 3d. increase, though costs outside the control of the undertakers were 4½d., and the savings effected were 1½d. According to the strict letter of sub-section 3 and the proviso thereto, the company who made their savings between 1913 and 1921 come off the worst. In fact, they get no credit whatever for the savings. The company who effected all these savings since 1921 get the full credit; and the company who saved partially in one period and partially in another get the portion which they have saved during the second period.

Of course, there are few companies who effected great economies between 1914 and 1921. On the other hand, there are many undertakings, who applied during the second half of 1922 and the first half of 1923, who had, by that time, improved on their pre-war position. If their first price granted under section 1 has been allocated on the strict basis of the cost of gas, these companies lose. By the words "correspondingly revise the price," the Board of Trade are given wide powers; and it may be that this word "correspondingly" can enable the Board to re-adjust prices under revision where adjustment should have been made in connection with the price granted under the first Order.

The Ilford Council's representative suggested that any adjustment in price due to economies would be an interference with the pre-war standard price. It is difficult to see how this suggestion can be maintained. On the contrary, the claim is to establish the right to such savings and increased dividends as would have matured under the sliding-scale and under the original standard price. If at every revision the savings due to economies are not taken into account, there would be a virtual decrease in the company's original standard price; for had costs remained normal, economies would have resulted in a cheaper selling price for gas, and higher dividends.

The Counsel for the Gas Light and Coke Company raised a point of interest on the question of procedure, when he drew attention to sub-section 6 of section 1 of the Act, which provides that the Board of Trade shall give notice, in the "London Gazette" and in such other manner best adapted for informing persons affected by the application for, or proposal to make, an Order, of the standard price per therm proposed. The Director of Gas Administration rightly pointed out that there was nothing in the sub-section of the Act which related to a public notice *before* the inquiry. This is a very material point, for in the Rules relating to applications for Amending Orders, there is no obligation upon applicants to state the revised standard price. The applicants merely have to file documents showing by reference, in detail, to the published accounts of the undertakers, the alteration in the cost of production and supply, upon which the application is founded. This is a comparatively simple matter and does not involve the working-out of a revised standard price. In view of the fact that sub-section 6 above referred to provides that the Board of Trade shall state in the notice the standard price per therm proposed, it is difficult to see how this notice could be given upon the mere application, and before the inquiry is held. It is to be noted that the sub-section empowers the Board of Trade to give public notice "of the application for *or* proposal to make an Order." In the circumstances, the correct thing for the Board of Trade to do will be to publish the proposal to make an Order, which will be within the spirit and wording of the Act. Counsel for the Gas Light and Coke Company probably had all these points in mind, but wished to get an indication from the Board of Trade with regard to future procedure.

OPENING OF MESSRS. JOHN WRIGHT'S NEW CANTEEN.

An interesting ceremony took place last Wednesday, on the occasion of the opening of the new canteen of Messrs. John Wright & Co., at Essex Works, Aston, Birmingham.

The main building, which has been specially constructed for the use of the workpeople, is capable of accommodating about 500 diners, and special care has been taken to make the canteen attractive and comfortable in every way. The building is also eminently suitable for other social functions. In addition to the main dining hall, separate dining rooms have been provided for the male and female members of the staff, and also for the female workers in the factories. The kitchen is equipped with the latest type of gas-heated apparatus, manufactured by Messrs. John Wright & Co. Owing to its greater cleaniness, efficiency, and saving of labour, the whole of the cooking is done by gas.

Mr. J. F. DAVIES (Managing-Director), who presided, referred briefly to the earlier history of the canteen, and to the fact that a warm, nourishing, and appetizing dinner, including two vegetables, was now provided for the modest sum of 7d. A vigorous Committee had, he said, recently been appointed, representing all sections of the workers; and everything would be done in the interests of the employees to improve the tariff still further, and to make the canteen even more attractive.

Alderman HENRY SIMPSON, in formally declaring the canteen open, complimented Messrs. John Wright & Co. on the magnificent building and equipment which had been provided, and warmly commended them for the keen interest they were taking in the welfare of the workers. He recalled the time when, as a worker, he himself had been compelled to cook his mid-day meal on a shovel, amid surroundings which were none too comfortable. The physical fitness and efficiency of the worker depended in no small measure upon the provision of warm meals, under conditions which were in themselves attractive and helpful; and he expressed the hope that the workpeople, in their own interests, would support the canteen in every possible way, and would not be slow to take full advantage of the splendid provision which had been made for them.

In connection with the welfare work undertaken by Messrs. John Wright & Co., it should be recorded that the Social Club, managed by the workers themselves (with generous financial help from the Company), has organized a series of successful concerts and dances during the winter months, and that it now has its own playing fields for football, cricket, hockey, tennis, and other games.

The Chemistry and Physics of Clays and Other Ceramic Materials.—This is the title of a new book written by A. B. Searle, and published by Messrs. Ernest Benn, Ltd., No. 8, Bouverie Street, E.C. 4. A review of this work will shortly be published in the "JOURNAL."

IMPROVED SCREEN FOR THE GRADING OF COKE.

Those responsible for the management of gas undertakings may read with interest of an arrangement for the grading and screening of coke which has been working for some time with marked success at the Poplar Station of the Commercial Gas Company. Three most important factors are concerned to a large extent with the selling and marketing of coke—viz, its quality, its cleanliness (freedom from breeze), and its correct size or suitability for the purpose for which it is to be used. There seems little doubt that the sale of coke could be increased by grading to a suitable size for various uses. Prior to the installation of the screens, the coke was passed through a cutter, resulting in a large percentage of breeze. An adaptation of the jigger screen has therefore been installed, with marked and instantaneous success. The screen is known as the Harris Patent Vibrator Screen—so named after the inventor, Mr. R. P. Harris, of the Commercial Gas Company, Poplar.

The Screen Described.

By reference to the illustration, the working arrangement of this screen will be seen. It will be noticed that four gradings are obtained in a very compact space. Primarily the device consists of two pans inclined in opposite directions, with the upper part longer than the lower one; the requisite motion being imparted thereto by eccentrics and rods. These two pans have a positively defined movement path, and are of the ordinary jigging screen type in use at various works. With the present invention, the pan A becomes a carrier, and is moved as heretofore. The screen B_1, to which is rigidly attached a screen B_2 of finer mesh, is supported from the carrier in a relatively free manner by means of brackets, to which are attached springs C_1, so that when the carrier is agitated it results in the screen experiencing movement, in a more or less vertical direction, of a magnitude such as to ensure the coke rising periodically and to prevent the meshes of the screen becoming clogged. The movement of these screens in relation to the reciprocated frame is limited in each direction by stops, which are adjustable. Likewise, as shown in the illustration, the lower or shorter carrier is provided with one screen plate D attached to, and suspended from, the carrier in a similar manner to the above.

The immediate advantage of this extra or vertical motion will be gathered when it is mentioned that it is impossible for the screen plates to choke-up during the passage of the coke and breeze. The screening of the coke is, in fact, so positive in its action, almost as soon as the coke gets on the screen plate, that it is possible to put a comparatively large capacity screen in a small amount of space.

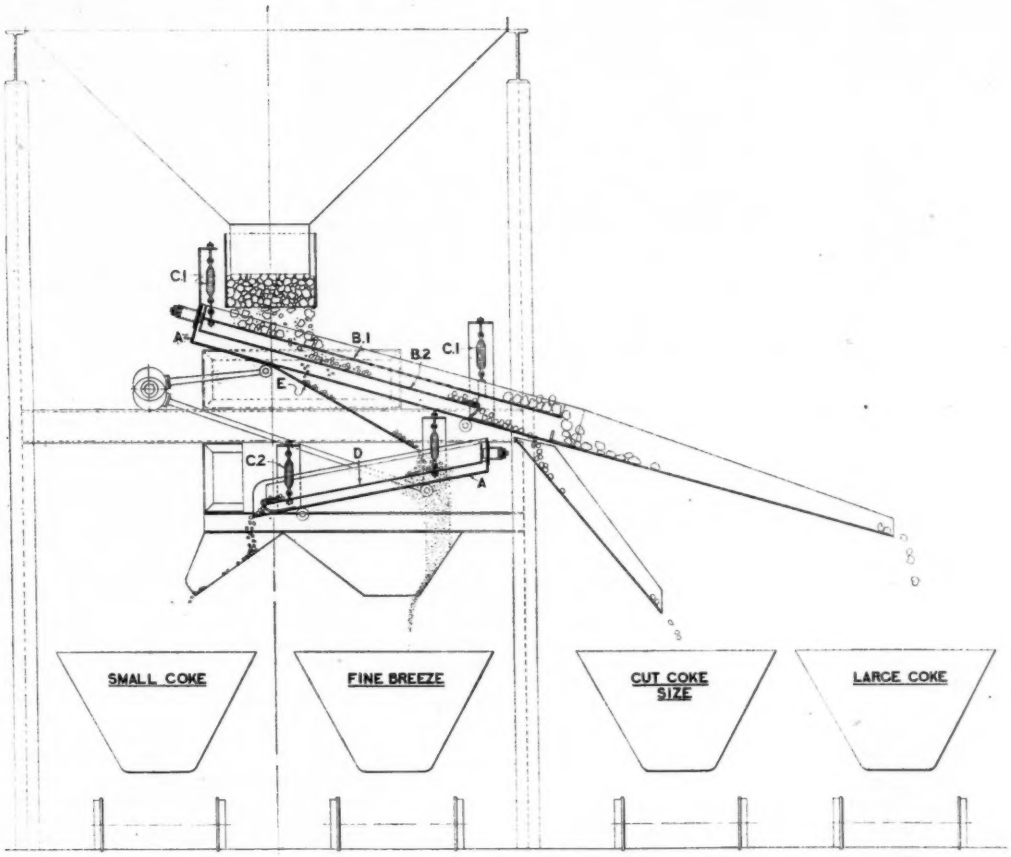
The screen plates also are worthy of mention, inasmuch as an attempt has been made to reduce the bridge pieces to an absolute minimum, thus giving a maximum amount of screening capacity. One big objection to screens has been that the amount of metal lost round the holes has seriously depleted screening capacity of a certain area. This difficulty has been overcome by the introduction of special screen plates for the "Vibrator" screen.

Further reference to the diagram will show that the coke leaving the hopper is received upon the upper screen plate. The large coke passes over this screen plate, and is delivered into a receiving truck or hopper. The smaller sizes pass through the second screen plate B_2, and the cut-coke size passes over this plate into its receiving truck or hopper. The smaller coke then passes through the screen plate B_2 on to a deflecting plate E, which delivers on to the screen plate D. Two further gradings are possible here, and small coke and fine breeze are obtained from the latter screen.

Its Advantages.

Although the diagram shows the screen working in conjunction with skips or trucks, it is adaptable to the feeding of hoppers—both systems being in operation at the Poplar Works.

Where there is a demand for a certain size of coke, the advantages offered by the "Vibrator" screen are most pronounced. For instance, if large coke only is required, an ordinary jigger screen would pass (say) 60 p.ct. of the coke delivered, the remaining 40 p.ct. being 2 in. and under. This latter would then have to be re-handled and transported to another form of screen, in order to eliminate the fine breeze and small coke, if further sales were required. With a "Vibrator" screen, however, the whole of the grading is done automatically at one time, and the operation of grading is carried out even more efficiently than in a rotary screen, where choking takes place to a certain extent.



"VIBRATOR" COKE SCREEN AT THE POPLAR WORKS.

Actual Tests.

Actual tests at the Poplar Works show that the following gradings and percentages are daily obtained without any extra labour or machine cutting, or extra power:

Large coke	58 p.ct.
2-in. ,,	29 ,,
¾-in. ,,	7 ,,
Breeze coke	6 ,,

The "Vibrator" screens, as mentioned above, have been installed with very marked success at the Poplar Works of the Commercial Gas Company; and the sole manufacturing rights of the patent have been entrusted to Messrs. W. J. Jenkins & Co., Ltd., Engineers, Retford.

COKE AND ITS USES.*

REVIEWED BY G. M. GILL.

In this book by Mr. Nicol, the Engineer and Fuel Expert to the London Coke Committee, the reader will find all the facts and figures relating to coke, and all compiled in a complete and useful form. On reading the book, it is early realized, even if one did not know it beforehand, that the author has practised what he preaches; and throughout he quotes chapter and verse for his statements.

That coke is shown in a favourable light goes without saying, not because the author is an enthusiast on his subject, but because those who know most about coke, its characteristics and possibilities, are invariably enthusiastic of its potentialities as a highly suitable fuel for many purposes for which it is used but little in the majority of English towns. Mr. Nicol's work is therefore to be welcomed as a practical guide to its proper use.

The book under review contains in all 134 large pages, and is printed in type of more than average size. This renders it easy to read. The illustrations also are reproduced on a large scale. The subject is divided into twenty chapters; each different use for coke being given fairly full attention. The book is on the whole well-illustrated, though a notable omission is the forced-draught furnace supplied by the London Coke Committee. The "Wilton" and the "Turbine" furnaces are the only forced-draught furnaces shown, though there are others of at least equal merit. It might here be suggested that the various types of closed stoves, for heating both rooms and water, do not receive the full consideration the subject merits. Both in America and in Scandinavia closed stoves of various types are giving such excellent results with coke that a little more space might well have been devoted to these appliances, especially as central heating in England has been receiving more attention of recent years. The Danish coke stoves, too, are so attractive in appearance, and so well-designed and made, that in the interests of coke these stoves deserve to be more widely known. The author appears to have formed the opinion that existing domestic grates are not altogether suitable for the use of coke. While it is possible to agree that many are unsuitable, there are, however, thousands in use which would give excellent results with coke. If the use of this fuel is to depend upon the installation of special grates, the progress must indeed be slow; and therefore it is suggested that more attention might be given to what now exists.

The author does not deal very fully with the essential differences in the firing of coal and coke in hand-fired boilers. The undoubted fact that nearly all boiler stokers are in the first place trained to fire coal, makes it essential that the proper method of firing coke should be thoroughly explained, and then enforced. For this reason a clear exposition of the fundamental essentials in the hand-firing of coke might, it is suggested, well be included in the next edition.

The book is such a good one that it really does not call for any but slight criticism; and it may be that the omissions to which reference has been made were caused by a limitation of space. If so, it is difficult to see what Mr. Nicol could have excluded to make room for anything else. Looked at broadly, after perusal of the volume, there is little doubt that really substantial progress has been made in London in the introduction of coke for uses for which it is admirably suited. It is indeed a complete fallacy to think that there is any limit to its use. Its sale depends upon its quality, its price, and the skill and energy with which it is pushed. The reader will certainly become converted to this view, if he now holds a contrary one, as the result of reading the treatise.

To deal in more detail with the subject matter, two chapters are devoted to coal carbonization and the production of coke. This is followed by a chapter on "coke lore," in which some of the supposed disadvantages of coke are laid low by the author. Chapter IV.—"Coke as Fuel for Steam Raising"—briefly deals with the general subject only, while Chapter V. deals with the use of coke in electric power stations; the Sandwich system, invented by the author, being here described. The same subject, and, in fact, the use of coke generally in mechanical stokers, is dealt with in Chapters VI. and VII. Coke as a fuel for hand-fired boilers receives attention in Chapter VIII.; while in later chapters the evaporative capacity of coke-fired boilers, the influence of excess air, and the extent to which forced draught affects fuel economy are discussed at some length.

Mr. Nicol rightly links up the subject of coke with smoke prevention; and, while the use of this fuel is a complete preventative, it must regrettably be admitted that the quantity of coke available for sale is altogether too small to have a very noticeable effect on this problem. The author discusses the possibility of the wider purchase of fuel upon the basis of its calorific power; and, indeed, it is to be hoped that some such basis will be more generally adopted in the near future, for it will undoubtedly have the effect of inducing colliery owners to pay more attention to the quality of coal placed on the market. Coke as fuel for steam wagons and for marine boilers receives attention in two short chapters; and this is followed by a chapter on the grading of coke—an all-important matter if a wide market is to be found for the fuel, and satisfaction given to the user. The last three chapters deal with the domestic use of coke for the heating of rooms, hot water, and for cooking; much interesting information being given.

The book can be strongly recommended to all interested in this subject; while users of fuel generally will find much within its pages to open their eyes to the possibilities of a fuel made at their very door, and which, intelligently used, would result in economy in their fuel bills, and in clean chimneys.

* "Coke and Its Uses in Relation to Smoke Prevention and Fuel Economy," by E. W. L. Nicol. Published by Messrs. Ernest Benn, Ltd. Price 19s. 6d. net.

MECHANICAL STOKING.*

The value of the series of technical primers published by Sir Isaac Pitman and Sons, Ltd., has been increased by the publication of a book on mechanical stoking, written by Mr. David Brownlie. The author is an expert in all matters pertaining to boiler practice, and, moreover, he is a gifted writer. Consequently one looked for that personal element which is such a necessary factor in a scientific or technical work; but, except for twenty pages out of a total of over two hundred, in this respect we are disappointed. Not that the book fails in its purpose—far from it. As the title indicates, it is a practical treatise on the essentials of machine stoking and the construction and operation of mechanical stokers, and is intended to meet the requirements of factory owners and managers, engineers, mechanics, boiler attendants, and students.

The volume is divided into six chapters. In the first is given a short account of the history of mechanical stoking, especially the period before 1845, concerning which very little has hitherto been published. Then, in the next four chapters, all the makes of stoker on the British market are described. From this lengthy summary those interested in the subject will gain valuable epitomized information to broaden their knowledge of the numerous designs of mechanical stokers. The final chapter, by far the most important, deals with the advantages and disadvantages of, and the best methods of working, mechanical stokers; and it is in this that the author expresses his views—views which are founded on intimate experience, and in which the greatest interest lies. Mr. Brownlie has examined personally over 2000 steam boiler plants in the British Isles, including 500 or 600 mechanically-fired plants; and his experience is that hundreds of firms believe strongly in mechanical stokers, while, on the other hand, an equally large number have condemned them. This difference of opinion is largely due to the fact that proper scientific methods of control are not adopted in the working of steam-boiler plants, and general methods of steam generation are out of date.

Mr. Brownlie gives the average net working efficiency of boiler plants in Great Britain as 58 p.ct. It is easily possible, he states, to run a boiler plant at a net working efficiency of 75 p.ct., representing a saving of 22 p.ct. in the coal bill. Existing conditions correspond to a national loss of about twenty million tons a year on the total national coal bill of about ninety million tons for steam generation. The author points to scientific control as the means of combating this wastage. Modern methods of control may be said to consist of an efficient costing system of steam generation by the installation of a complete equipment of control instruments. Included in such instruments are a water meter to keep a continuous record of the water evaporated from hour to hour, and in certain cases a steam meter as well; an automatic coal weigher; a combustion recorder to give a continuous record of the percentage of carbon dioxide in the flue gases; and various other apparatus such as a fuel calorimeter, draught gauges, pyrometers for flue-gas temperatures, &c.

The publication serves a definite purpose. It presents in tabloid form a mass of sifted information which cannot fail to be of service to all concerned in any way with boiler practice.

* "Mechanical Stoking," by David Brownlie. Published by Sir Isaac Pitman and Sons, Ltd., Parker Street, Kingsway, W.C. 2. Price 5s. net.

Yorkshire Junior Gas Association.—There is to be a meeting of the Association at 3.15 next Saturday, the 15th inst., in the gas showrooms, Darley Street, Bradford, when two papers will be submitted—"Modern Carbonization in Continuous Vertical Retorts," by Mr. A. Y. Plant, of Halifax; and "Naphthalene; its Deposition from Coal Gas," by Mr. W. I. Ineson, of Bradford.

Loss of Heating Value of Coal During Storage.—Messrs. Byrne and Davis, at a meeting of the American Chemical Association, dealing with the heat-value losses of coal during storage, said that previous attempts to measure this loss had yielded varying results, owing to the changes in weight of the coal due to oxidation, and to the difficulty of obtaining exactly representative samples. The experimental method used by them consisted in accurately weighing duplicate portions of coal suitable for calorimetric determination from the same sample—subjecting one portion to oxidation, and immediately determining the heating value of the other. The heating value of the oxidized portion, as compared with that of the other, was then exactly obtainable, irrespective of any loss or gain in weight during the oxidation process. Loss in heating value varied from 0·02 to 0·6 p.ct. for coking coals, under various conditions prevailing in the tests.

THE POSITION OF MAINS IN PUBLIC HIGHWAYS.

By STEPHEN LACEY, B.Sc., Assoc. M.Inst.C.E., Distributing Engineer to the Gas Light & Coke Company.

[A Paper read at the Session arranged by the Institution of Gas Engineers at the Public Works, Roads, and Transport Congress.]

Everyone spontaneously associates transport above ground with public highways, but, because "out of sight is out of mind," few think of transport below ground when the subject of roads arises. The unseen transport, which goes on unceasingly, is none the less essential to present-day urban civilization. What, for example, would a house to-day be worth cut-off from connection with water and gas mains, the drainage system, and from electric and telephone cables? It would be nothing but a derelict.

I introduce my subject in this way because it is important that all the factors in the urgent problems connected with the reconstruction and maintenance of public highways should be seen in true perspective, and because it is natural that the highways' engineer, responsible for the maintenance of the surface of the roads, should be inclined to look upon anyone who has the right to break up the roads, to lay or repair mains and communication pipes, as an unmitigated nuisance. Perhaps I may be allowed to reinforce my position by giving an illustration of the magnitude of the underground traffic carried by mains, and the extent to which the congestion on the surface of the roads is relieved by it.

The weight of gas distributed by the three Metropolitan Gas Companies through the underground distributing systems is about 1 million tons per annum. By far the greater part of this is used for heating and cooking, and is consumed in appliances which have displaced others using raw coal. If it were possible to revert to coal for all these varied purposes, at least 4 million tons per annum would be required; and the whole of that, together with the ashes therefrom, would have to be carried by road.

Turning now to the question of the position that mains should occupy in public highways, there are two chief points of view to be considered. In the first place, it is obvious that mains should be laid in positions which will necessitate the least possible disturbance of the road, either when the main is originally laid or subsequently; this from the standpoint of the road authority and road user alike. In the second place, attention must be paid by the undertaking owning the mains to the relative costs incurred by the adoption of alternative positions. It will, I think, generally be found that the two contrasted points of view lead to conclusions which are not in conflict with one another.

In any distributing system, whether water, gas, or electricity, there are, in general, two classes of mains. There are trunk, or feeder, mains, which are not connected direct to consumers' houses; and fed by the trunk mains there are the smaller mains from which the consumers are directly supplied.

SERVICE MAINS.

Dealing first with the service mains. It is generally agreed that one such main should be laid in either footway of roads in urban districts where the number of service connections is relatively large, and where the volume of traffic necessitates the laying of high-class paving in the carriageways. The reason for this, of course, is that with a main in each footway the lengths of the services are reduced to a minimum, and new connections and repairs to mains can be made without disturbing the carriageway. It is impracticable to lay down a hard-and-fast rule defining the circumstances which warrant the laying of duplicate mains; each case must be considered on its merits.

The provisional rule adopted by the author in setting out the distributing systems for housing estates developed since the war is to lay single mains in subsidiary roads where the width of the carriageway is about 25 ft. or less, and to lay close to the kerb line in one of the footways; the idea being that if in the future a change in conditions should make it desirable to lay a second main, both mains and all the service pipes would then lie clear of the carriageway. When single gas-mains are laid in one footway to supply customers on both sides of the road, they have to be at a greater depth than usual, because service pipes conveying gas must have a fall to the main, in order to provide for the collection and removal of water condensed from the gas.

TRUNK MAINS.

In thoroughfares with wide footways, it may be practicable to lay trunk mains as well as smaller mains in the footway; but usually the footways are not wide enough to do more than accommodate all the service mains and cables. But there is less objection to laying trunk mains under carriageways than the service mains, for the reason that, as no service pipes are connected to them, they are not often opened up.

DEPTH OF LAYING.

The depth at which mains are normally laid below the surface of the road depends to some extent on what they carry. Water mains have to be laid at such a depth as to be out of reach of frost. Three feet is considered the minimum safe depth. The depth at which gas-mains are laid is not limited in this way, and it is usual to lay at about 2 ft. 6 in. under carriageways, and at 2 ft. under footways. It would appear reasonable to assume that the greater the depth at which a main is laid the less the risk of damage by vibration or other causes; but this assumption is not borne out by experience. The solidity and uniformity of the bed on which the pipes lie are the factors that have the greatest influence in establishing and maintaining conditions which ensure the stability of the mains under stresses due to vibration, &c., and in the author's experience the depth at which the main is laid has proved to be of secondary importance.

SUBWAYS.

The construction of subways has often been advocated as a remedy for the opening up of roads for alterations and additions to mains; but they can only be economically built under special conditions. An examination of the existing subways will show that they have practically all been built in new roads, such as the Victoria Embankment, Holborn Viaduct, and Kingsway, which have formed part of great reconstruction schemes in areas already highly developed. Schemes to build subways in existing roads already congested with mains would involve not only the cost of building the subway, but the cost of diverting the existing mains. This would certainly prove prohibitive. It must also be said that subways will always be a potential source of danger, so long as bomb dropping from the air is a possibility.

NEW MAINS AND ROAD-WIDENING SCHEMES.

It must, of course, always be borne in mind, when discussing the question of the position of mains in public highways, that the distributing systems of water and gas undertakings in particular have not been laid down in the last few years, but are to a great extent heritages from the past which can be only slowly and laboriously modified to conform to present-day requirements. The settled policy of all progressive undertakings owning mains under public thoroughfares is to take every opportunity afforded by the re-paving works of road authorities to overhaul and modernize their plant. New mains are then laid in the footways where possible, and superfluous mains and service pipes under the carriageways thrown out of use. The importance of ensuring that this work shall be carried out thoroughly and expeditiously is becoming more and more generally recognized. This being so, the cordial co-operation of road authorities and the undertakings, which is essential to successful working, follows as a matter of course.

In conclusion, brief reference should be made to the great schemes of reconstruction and widening of main roads that are being carried out all over the country. In such instances, the owners of mains lying under the original road are often being faced with an unprecedented and serious situation. It may be, for example, that a main properly laid in the original road at a uniform depth will, if unaltered, be found to be wandering from side to side across the new road, and at greatly varying depths, where the reconstruction involves alterations in levels. It is obvious that if mains were to be left in such positions under new roads, the surface would be liable to be continually broken up by openings for alteration and repair; and it would therefore appear that those road authorities take the long-sighted as well as equitable view who look upon the cost of diverting such mains as an integral part of the cost of reconstruction.

SUBWAYS.

On the question of subways, Mr. Lacey made the following remarks, additional to the paper.

Perhaps it will interest the meeting if I enlarge a little upon the question of subways, by saying something of my Company's experience during the war. The total mileage of mains is 2763. There are 9 miles of subways in my Company's area of supply, and there are 14 miles of gas-mains in these subways, varying in diameter from 4 in. to 48 in. The subways are inspected daily, and any leakages that develop in the joints are therefore quickly discovered and remedied under normal conditions; but under war conditions, the situation is very different. The subways are at certain points open to ground surface, such openings being used for lowering pipes into the subway and for ventilation, and covered with an open grating. A bomb falling on the subway at any of these points would certainly break through, and it is probable that at no point could the crown of the subway stand the impact of a bomb. The only precaution that it was possible to take was to make preparations to close down in the shortest possible time the valves isolating the mains from the general system, should the necessity have arisen. As an indication of what that entails, I may say that the isolation of the gas-mains in the subways under Charing Cross Road and Shaftesbury Avenue, which are connected at Cambridge Circus, involved the shutting-down of nearly 48 valves. Fortunately there was only one instance of a main in a subway being damaged by a bomb, and then, by remarkably good fortune, no harm came from the escaping gas. The bomb I refer to fell on the crown of the pipe subway situated under the footway of the Thames Embankment by Cleopatra's Needle. In that subway there are three gas-mains. Two of these mains are 36 in. in diameter, and the other 30 in. The 30-in. main lies over one of the two 36-in. mains, and a pipe in this main was completely shattered by the bomb which broke through the crown of the subway—without, however, damaging any other plant in the subway. The 30-in. main had been shut down a few weeks before the bomb fell, except for a connection to a 4-in. main. The nose of the torpedo was found in the bottom

of the main when it was repaired the following day. One of the undamaged 36-in. mains carries gas at high pressure, and it may be well imagined that had it been smashed the difficulty of getting the situation under control in time to prevent a disastrous explosion would have been very great.

Discussion.

The CHAIRMAN said the paper dealt with a very important matter from the gas engineer's point of view; but there was an equally important one—viz., the condition of the roadways as affecting the gas-mains. With the increasing traffic, and the change in the methods of road construction, it was becoming, not only much more costly, but a much more difficult task, to trace escapes of gas which might arise from leaky joints or fractures of mains; and with the desire expressed in Mr. Bloor's paper on the part of the gas undertakings to do everything within their power to restrict leakages to an absolute minimum, it was essential that there should be the closest co-operation between all authorities responsible for the roadways, with the object of reducing the necessity for breaking up the road surfaces. If timely warning were given to the gas undertakings, then the necessary steps could quickly be taken to deal with the matter, and so prevent the possibility of danger to life through explosion or through the escape of gas. The Board of Trade had recently endeavoured to bring into closer contact those authorities, with the view of formulating schemes which would assist directly the gas undertakings, and incidentally the whole community, by collective action and by closer relations. This was a matter of as much importance to the gas industry and to the general community as the question of the position of mains in the roads.

Mr. W. J. LIBERTY (City of London) said the roads to-day were very different from what they were twenty years ago. In the large towns and cities there were reinforced concrete roads 2 ft. in thickness underneath the wood or asphalte. Thus the roads were really hermetically sealed, and what took place under them in the way of leakages of gas or water was an unknown quantity until something happened, and then it might be found that the mains had been leaking for a considerable time. This was specially to be borne in mind in the case of gas-mains, because, when a leakage occurred under a hermetically sealed road, the gas, after a time, would be drawn into a warm cellar or basement, and find its way into a building and do a great deal of damage. Another point of great interest in regard to mains was the question of obstruction. He exhibited some photographs showing the obstruction in central London while mains were being laid, and made special reference to a photograph of Ludgate Circus. In that particular case the Post Office were laying some 53 ducts down Ludgate Hill to Ludgate Circus, and estimated originally that the work would take three months. As a matter of fact, it took over a year, and the cost was two-thirds more than had been estimated, all on account of the obstructions met with in the ground. The author had mentioned that there were 9 miles of subways in the London County Council area, and about 2 miles in the City of London; and these subways had been of the utmost value. The subways running up the Commercial Road, Victoria Street, and up to Westminster and the Houses of Parliament, housed 48-in. and 36-in. mains in an admirable manner. It was impossible now to have subways of this character under the old roads, because of the heavy cost; but wherever the London County Council made a clearance and built new roads, it was the policy to construct a subway. Another danger with regard to mains in places like London was the possible effect of the building of the tube railways many feet below the surface. The South Metropolitan Gas Company found this out in connection with the extension of the City and South London Railway to Clapham. They got into a pocket of this sand, which let their mains down. The London Gas Companies had since obtained parliamentary powers to protect themselves against this sort of thing. With regard to ordinary surface work, the closest co-operation was necessary between borough surveyors and engineers and the gas authorities. Wherever it was possible to make a subway, he was in favour of it. He had had charge of subways for many years, and was convinced that they had proved their utility and cheapness to those who laid their mains in them.

Councillor A. H. COLLINS (Salford) disagreed with the author in saying that it was a secondary consideration whether the mains were laid close to the surface. He was Chairman of the Highways Committee at Salford, and nearly all the traffic from the Manchester Ship Canal to Lancashire went through there. The various mains in Salford were laid some years ago at a depth which was sufficient for those days; but as a result of such a continuous stream of heavy traffic over the roads the gas and water mains were breaking at the rate of one per week, and a constant supply of men to repair the breakages had to be maintained. The obvious suggestion, of course, was that the mains should be re-laid; but the Canal Company were altering the whole of their inlet and outlet gates. When this was done, it was proposed to take up the roads, and sink the pipes considerably lower. It had been found necessary to go to a depth of 4 ft., and then put 18 to 24 in. of concrete on top, to protect the mains from this heavy traffic. Otherwise leakage took place.

Mr. LACEY: Was the foundation on which these mains were laid in the first place a solid one?

Mr. COLLINS said the soil had not been disturbed for two or three hundred years, and it had to be dug up with picks. It was as difficult to break up as concrete.

Mr. B. R. PARKINSON expressed the wish that the popular Press should get hold of the figures which Mr. Lacey had given, because they showed what real assistance the gas industry was giving to road transport. In the case of the three Metropolitan Gas Companies, the weight of the gas distributed amounted to one million tons per annum, whereas four million tons of coal per annum would have to be transported if gas were not available. He wished the paper had been a little longer, for there were many things which might have been dealt with. One would like to have had from the author a description of his ideal road, with the best positions for the gas, water, electricity, and other mains, apart from the question of subways. There might also have been some reference to electrolysis in connection with tramways. The reference to the new roads that were being constructed was also interesting, because this was a source of great trouble to gas engineers who, having laid their mains years ago in some secluded footpath or track at the side of the road, might find them perhaps only 6 in. under the surface of these new roads. In these circumstances, happy was the gas engineer whose mains were of steel. Steel pipes were absolutely unbreakable, and offered better facilities for jointing. They could be laid in long lengths, because of their resiliency. In case of subsidence, they held up the road, instead of snapping. Fewer joints were needed, and steel offered the greatest possible resistance to the effects of heavy traffic, and thus reduced the leakage account. High-pressure gas was nearly always distributed in steel mains. Why should not low-pressure gas be distributed in this way? Moreover, welding was possible with steel mains, making a continuous length. There was, of course, the danger of corrosion, both external and internal. Corrosion, however, not only affected steel mains, but also the wrought-iron services which supplied gas to the houses. It also affected the holders and other gas-plant; it was not a matter which should be allowed to prejudice their minds against the use of steel for gas-mains.

Mr. E. WORRALL (Stretford Borough Engineer) said that from the point of view of London traffic the saving of the transport of four million tons of coal per annum, referred to by the author and the previous speaker, was infinitesimal. In his own suburban district of a northern city he carried a tonnage of between 5 and 6 million tons a year over one road alone. He did not think it could be claimed that gas companies served a really useful purpose in diminishing the traffic problem. A matter of interest was the detection of leakages under sealed roads, to which reference had been made. He believed that there was a method of detection by means of which leakages could be closely located. A small 1-in. pipe was carried from the sockets to the surface; the idea being that the leak would find the path of least resistance. Something was certainly required to prevent the breaking up of lengths of road to find leakages. He was disappointed that the author, who must have had great experience in reference to all these matters, had not given a strong lead in the direction in which a solution might be found. He did not follow the author in the part of the paper in which he said that, though at first one main might have to suffice for a road, eventually there should be two mains—one on each side; thus the breaking-up of the road for individual services would be avoided. The point was that when the first main was laid, it would be necessary continually to break-up the road to serve the houses on the other side. Thus, though when there was a main on either side it would not be necessary to break-up the centre of the road, most of the breaking-up would already have been done.

Alderman MUIRHEAD (Liverpool) spoke of the difficulties involved by so many statutory authorities opening the roads, but added that the complaints of the public were often made in ignorance.

Mr. S. CHANDLER (Tottenham) said that Mr. Lacey was to be congratulated upon the manner in which he had dealt with the subject. From the point of view of gas undertakings, roads had, of course, very special interest; and the great improvement in surfaces, the use of hard wood blocks, concrete, expanded metal mesh, and reinforced materials now forming their construction, made the matter of great moment, especially to the distributing engineer. It was interesting to note Mr. Lacey's calculations as to the effect of the underground supply of gaseous energy, and to realize the considerable saving in wear and tear to road surfaces by the transmission of gaseous energy in a manner which did not interfere with conditions above the surface. This was a point which brought home the valuable character of fuel supply by pipes. Modern practice was in the direction of mains being laid under footpaths or walks, for the reasons given, together with ease of repair, less disorganization of traffic, and, what was equally important, lessened vibration, and absence of the very heavy pressures now common on all main roads. Heavy weights on road surfaces were now general; and the case for mains under paths could not be in dispute. It would seem, however, that footpaths generally were already occupied by telephone, telegraph, and electricity services, the various jointing and junction boxes of which often made it difficult to find accommodation for mains and services. The policy of the Post Office in converting overhead lines to underground conduits did not help gas and water interests; but this condition of affairs was unavoidable, and must be contended with. In many, if not all, instances where new road construction was undertaken, it was necessary to overhaul and put into repair the mains and services, and possibly to divert—certainly to examine—joints, strip services, and relay in pitch and troughing. The expenditure involved—which, were disturbance not taking place, would be unnecessary from the undertaker's point of view—was heavy; and it did not seem reasonable that the onus of this cost should be thrown upon the gas and public service companies. Taxes obtained from private and commercial motor vehicles were, he believed, partly allocated to new road construction, which included re-conditioning of all mains and services under them. The co operation of road authorities and public service undertakings owning mains under the public thoroughfares was very desirable; and previous notification of alteration, re-paving, &c., was necessary, so that opportunity could be given to the main owning bodies to carry out any work rendered necessary by the local authority's requirements.

Mr. LACEY, replying to the discussion, said the conditions in the City of London, referred to by Mr. Liberty, were to some extent unique. As to the point made concerning the difficulty of locating leaks in hermetically sealed roads, the fact was that these roads made it easier to locate leaks, because even a small escape found its way into the Post Office boxes and pits under the footways where the men were working, and consequently were quickly reported. He had been taken to task with regard to his statement concerning the depth at which mains should be laid. He had not stated that the depth was not a factor, but that it was not the chief factor. On this point Mr. Sandeman, the Distributing Engineer of the Croydon Gas Company, had sent the following note, which was a striking confirmation of this:

> In his paper, Mr. Lacey states: "It would appear reasonable to assume that the greater the depth at which a main is laid the less the risk of damage by vibration or other causes. But this assumption is not borne out by experience." In confirmation of this, we have during the last twelve months relaid about 500 yards of 5-in.

main which was originally laid in 1863 with a cover varying from 4 in. to 1 ft. The road is one on which there is a fairly constant stream of heavy traffic; and I do not remember ever having to attend to any leakage on the main. When we examined the main we found the pipes in such an excellent condition that we relaid them at a greater depth, so as to ensure the service pipes having a sufficient fall.

This experience, continued Mr. Lacey, certainly agreed with his own—that if mains were laid shallow, but were well laid and in solid clay, they would carry heavy traffic without leakages. On the other hand, even if the mains were at a depth of 3 or 4 ft., but were in a bad foundation, they would give trouble; and he had known cases of this where mains had been laid deeper. Mr. Parkinson had referred to the controversial question of cast-iron *versus* steel mains, and had mentioned that the great objection to steel mains was corrosion. Corrosion was all-important. There had been a hundred years' experience of cast-iron mains, and it was known that in normal circumstances cast-iron pipes would last indefinitely. Experience with wrought-iron service pipes, on the other hand, did not encourage the wholesale adoption of steel without knowing more about it. One of the advantages of steel was that it could be used much thinner. Steel mains were only about a quarter the thickness of cast-iron mains; and from the point of view of corrosion this was a disadvantage. It had been stated that the paper did not put forward a definite solution to main-laying problems. He did not think there was any definite solution. At the same time, his view was that, where new roads were being constructed, the place for all mains was under the footpaths. These new roads were, generally speaking, wide, and in these circumstances the mains should not give any trouble. Reverting to Mr. Liberty's remarks and his recommendation to construct subways wherever possible, the trouble was that where it was feasible to put a subway the cost was often not justified, while where it was necessary the cost was prohibitive. Mr. Worrall must have misunderstood the paper on the point of having mains on either side of a road. What he meant was that in the case of roads of (say) 25 ft. or less in width, there need only be one main, but that when the road was altered a second main could be laid for the other side, to avoid the breaking-up of the new and finished road later for laying services. The suggestion to locate leakages more easily by running a small pipe from the back of every joint to the surface seemed to him to be impracticable, because he did not think highway engineers would be very enthusiastic about having a few more million surface boxes in the roads. In the case of the Gas Light and Coke Company, there were 2700 miles of mains; and if that were multiplied by the number of joints per mile, it would be seen that there would be a good few surface boxes to maintain and look after! As a matter of fact the escapes of gas under hermetically sealed roads in London were very much more easily found than they used to be. The surface of the roadway was an important factor in damage to mains; and for this reason gas engineers were indebted to highways engineers for the manner in which road surfaces had been improved in recent years.

A hearty vote of thanks was accorded the author of the paper.

THE PHENOLIC CONSTITUENTS OF VERTICAL-RETORT TAR AND LIQUOR.

An Extensive Research in Australia.

IN the "Journal of the Society of Chemical Industry" has been published the first part of research work on vertical-retort tar carried out by G. S. Curry, of the Australian Gaslight Company, Sydney, N.S.W. The work deals with an important question in an exhaustive and thorough manner; and a few abstracts of some of the main results obtained, and conclusions drawn, will be of undoubted interest to readers of the "JOURNAL."

The investigation described in the paper was undertaken with the object of discovering the cause of a red-brown colouration imparted to the water of the Parramatta River, round the Mortlake Gas-Works. As this colouration was most marked in the vicinity of the discharge pipe for the spent liquor from the ammonium-sulphate plant, it seemed probable that this liquor was the main cause. It was therefore examined to find if any substances were present which underwent oxidation on exposure to air. The liquor in question consists of a mixture of the ammoniacal liquors obtained from both vertical and horizontal retorts; and consequently samples of each kind were examined separately. From the results obtained it was proved conclusively that the colouration was due to the presence of polyhydric phenols in the vertical-retort liquor; negative results being obtained with that from horizontal retorts.

These polyhydric phenols occur in vertical-retort liquor to the extent of approximately 0·05 to 0·10 p.ct. by volume, and consist principally of catechol. A methyl ether is also present in small quantity (possibly guaiacol, catechol monomethyl ether); and small quantities of resorcinol and trihydric phenols also appear to constitute part of the mixture. It is of interest to note the method adopted in carrying-out this research. To secure sufficient material for an extended examination, about thirty-two gallons of ammonia liquor were concentrated to a small bulk, acidified, and extracted with ether. In this manner about 700 cub.cm. of crude phenols were obtained. This mixture was distilled, with the following result: Up to 130° C., the distillate consisted mostly of water containing a little oil in suspension; the temperature then rose rapidly to 250° C., very little distillate being obtained; at 250° C. the temperature remained almost constant till nearly all had distilled. The distillate, a yellowish oil, was again distilled; the main portion coming over at about 250° C. as before.

The distillate consisted of a light yellow oil, which, on standing, gradually deposited a white solid. Tests indicated that dihydric phenols were present in the mixture. The solid portion was again distilled; and its properties, and its behaviour towards alkalis, ferric chloride, ammoniacal silver nitrate, and nitric acid showed it to be catechol. Further tests on the liquid portion proved the presence of trihydric phenols; and the presence of resorcinol was inferred from the fact that, on fusing a portion of the oil with phthalic anhydride, a brown substance, similar to fluorescein, was obtained.

THE PHENOLS IN VERTICAL-RETORT TAR.

It is shown that the phenols in the tar produced by the carbonization of coal in Glover-West vertical retorts are similar in nature to those occurring in horizontal-retort and coke-oven tars, but that the content of phenol is much smaller, α and β naphthols are absent, and small quantities of polyhydric phenols are present. (These substances do not appear to occur in horizontal-retort and coke-oven tars; they are evidently destroyed by the greater heat to which the products of carbonization are subjected before leaving the retort.) Though there are only very small quantities of polyhydric phenols present in vertical-retort tar, it has been shown in the research that they are the cause of the coloured emulsions obtained when a disinfectant oil made from vertical-retort tar oil is added to water (disinfectant oils made from horizontal-retort or coke-oven tar oils give white emulsions with water), and the red colouration observed when vertical-retort tars are washed with alkaline liquids.

DISINFECTANTS MADE FROM VERTICAL-RETORT TAR DISTILLATES.

From a further study of the polyhydric phenols which cause the coloured emulsions, the author is able to put forward an explanation of why the emulsions vary in colour from pink to purple: On making-up a vertical-retort tar oil into a disinfectant oil (*i.e.*, by the addition of a suitable emulsifying agent, such as castor-oil soap or resin soap), and subsequently adding a portion of the emulsified oil to water, a slightly alkaline liquid is obtained—the alkalinity being due to partial hydrolysis of the soap in aqueous solution—which soon assumes a pink, slatey-blue, or purplish colour. These colourations have been found to be due to the presence of catechol in the oil; very small quantities of this phenol, in slightly alkaline solutions, causing the pink colouration, which darkens as a result of oxidation. If, on adding a portion of the emulsified oil to water, a slatey-blue coloured emulsion is obtained, it shows that the oil has, at some stage, been in contact with iron; the variation in, and intensity of, the colour depending on the quantity of catechol present, and also on the degree of alkalinity of the emulsion obtained on addition to water.

SUMMARY OF RESULTS.

From the data obtained in the research the composition of vertical-retort tar acid is probably as follows:

(1) *Monohydric phenols* (series $C_n H_{2n-7} OH$)—phenol, cresol, xylenols, trimethylphenols, tetramethylphenols, naphthol homologues, hydronaphthols, phenols of hydroanthracene and of other high-boiling hydrocarbons. *Polyhydric phenols* (series $C_n H_{2n-8} (OH)_2$ and $C_n H_{2n-9} (OH)_3$)—catechol, resorcinol, pyrogallol. A methyl ether (possibly guaiacol) is present in the mixed phenols occurring in the ammonia liquor. The presence of phenol was proved. In the cresol fraction, *m*- cresol was identified; but the main portion of the fraction appears to consist of *p*- cresol, while *o*- cresol is only present in traces. Of the xylenols, *o*- xylenol was identified.

(2) The approximate composition of vertical-retort tar acids is as follows:

Component.	P.Ct. by Volume.		
	Phenols.	Distillate.	Water-Free Tar.
Phenol	4	1·2	0·60
Cresols	23	6·9	3·45
Xylenols	22	6·6	3·30
Higher phenol homologues and polycyclic phenols	50	15·0	7·50
Polyhydric phenols (mainly catechol)	1	0·3	0·15
	100	30·0	15·00

(3) Disinfectants producing pure white emulsions can be obtained by carefully fractionating vertical-retort tar distillates through an efficient fractionating column, rejecting all oils boiling above 230° C.

"Journal" Subscriptions from our Dominions.—From January next, we have decided to reduce the subscription to the "JOURNAL" delivered in our Dominions and Colonies to 35s. a year. We are thus placing subscribers in the Dominions on precisely the same basis as those at Home. It will, of course, be understood that, at this rate, all subscription payments must be in advance.

of the boiler on the fan? He asked for further details of the electrical removal of oxygen.

Mr. BAMBER doubted Mr. Clegg's temperature of 280° Fahr., which was very low and not likely to give much chimney draught. As regards the effect of the heat from the boiler on the fan and motor, at Bolton the fan and motor were not fixed on the top of the boiler, but close to, and underneath, the waste-gas flue to the chimney. This flue had been lagged to prevent radiation of heat. As to the electrical removal of oxygen, the consumption of current was not very great.

Mr. A. COOK (Warrington) said they had a boiler similar to the one at Bolton, and the fan had been very successful. He asked the author if he had been troubled with the formation of iron sulphate in the tubes. In spite of precautions taken to limewash the tubes immediately after cleaning, they had experienced difficulties.

Mr. BAMBER, in reply, said they had trouble with the steam turbine fan, but little or no trouble with the electrically driven one. As regards corrosion in the tubes, they had experienced little trouble in ordinary working. After careful cleaning of the tubes, however, the boiler was out of action for some months, and prior to re-starting the tubes were examined, and were choked with iron sulphate. He thought the explanation lay in the absorption of sulphurous acid gases from the waste gases by the brickwork, and their slow liberation during the idle period, when they gradually attacked the tubes. It was advisable to examine the tubes from time to time during a lengthy stoppage.

Mr. H. E. STONE (Birkenhead) asked if the cleaning of waste-heat boilers, as compared with Lancashire boilers, was a serious question.

Mr. BAMBER replied that it was not.

Mr. W. H. BATTERSBY (Bury) said the type of boiler installed for waste-heat recovery was governed to a great extent by the carbonizing system adopted. In the Glover-West system one chimney per bed was the usual practice; and the small boiler was practically suited to these conditions. One great advantage of this arrangement was that flue travel between the setting and the boiler was obviated, and consequently heat losses were reduced to a minimum. In the one-boiler-per-bench system, heat losses due to long travel assumed a considerable figure. He had in his charge a "Galloway" waste-heat boiler working in conjunction with a bed of eight Glover-West vertical retorts. After eight months' continuous working, this boiler was examined; and the tubes and boiler were found to be in excellent condition. With regard to the recommendation of a good boiler composition for prevention of scale, in his opinion the only satisfactory method of dealing with this trouble was to instal a water-softening plant. The following figures were given as results obtained with a "Galloway" waste-heat boiler at Bury: Amount of water evaporated per hour, 523 lbs. Feed water temperature, 53° Fahr. Temperature under boiler, 835° C. Temperature above boiler, 469° C. Steam pressure, 90 lbs. = 331° Fahr. Superheater outlet, 648° Fahr.; inlet, 331° Fahr. Amount of superheat, 317° Fahr. Coal carbonized per setting, 23 tons. Coal carbonized per retort, 2·88 tons. Coke consumption in producers, 12·3 p.ct. (Dry, ash-free coke). Steam generated per lb. of carbon used in producers, 2·00 lbs. Heat efficiency of waste-heat boiler, 80 p.ct.

Mr. ASHTON (Messrs. Galloways), speaking of coke and solid fired boilers, said these claimed an efficiency of 55 p.ct., which could be increased to 65 p.ct. if economizers were used. As regards feed water, the use of water-tube boilers had caused more attention to be paid to the quality of the water. The water should be treated before it entered the boiler. Natural draught was the most dependable and the cheapest in the long run.

Mr. H. J. HAILSTONE (Rochdale) moved, and Mr. BRIGGS (Hyde) seconded, a vote of thanks to the author for his instructive paper. Mr. Bamber suitably replied.

THE WELSBACH MANTLE FACTORY.

Visit by the London and Southern District Junior Gas Association.

An afternoon is too short a space of time within which to inspect the whole of the processes carried on in a large and thoroughly up-to-date mantle factory; but so far as may be humanly possible, the feat was accomplished last Wednesday at the Broomhill Road, Wandsworth, works of the Welsbach Light Company, Ltd., by about seventy members of the London and Southern District Junior Gas Association. On arrival, the visitors—who included Mr. Walter Grogono (the President of the Association) and Mr. Leonard Lacey (the Hon. Secretary)—were met by Mr. B. Bark (the Works Manager), who was supported by members of the staff; and, in small parties, under experienced and tireless guides, the tour proved to be both profitable and enjoyable.

As has been said, the time limit precluded a complete inspection of everything there was to be seen; but nothing else stood in the way of members obtaining full knowledge of the complicated processes of mantle making as practised to-day. Mr. Bark gave his staff instructions that nothing was to be hidden, and that any questions asked should, as far as they were capable of doing it, be answered; and he himself afterwards admitted that some of them had been of a very shrewd character. Full understanding of the working of the wonderful machines was difficult; but all could, and did, admire the smoothness and efficiency of their operation. Some idea of the number and extent of the processes to be examined will be gathered, when it is mentioned that the number of mantles made annually by the Welsbach Company runs into many millions, and includes over 1000 different sizes, shapes, weights, or kinds. Their smallest upright mantle has a length of $1\frac{1}{8}$ in., and a width at the bottom of about $\frac{3}{8}$ in.; and the largest—which is claimed to be the biggest mantle in the world—has a length of 11 in., and a maximum width of over $5\frac{3}{4}$ in. The Company's smallest inverted mantle is about $\frac{7}{16}$ in. long, and some $\frac{6}{16}$ in. in diameter; while the largest has a length of $3\frac{3}{8}$ in., and a diameter of $1\frac{7}{8}$ in. Each box in which a mantle is packed is carefully marked, so that its history can be traced from the first operation until it leaves the factory. Incidentally it may be remarked that Welsbach are the only mantles used in British lighthouses; and the mention of the word "British," leads one to add that no worker employed in the factory is other than British.

The Chairman of the Company (Mr. J. R. Yates) afterwards expressed the hope that the visitors had seen good work well executed; and they certainly had done so. A beginning was made with the knitting and weaving of the yarns into stockings of various tensions and types of stitch. The latter has an important bearing upon the strength of the finished mantle. Generally speaking, and within certain limits, a complex stitch adds to the strength of the mantle, and also to its cost. Some yarn is woven instead of knitted, giving a fabric which produces a mantle of great strength and durability. A short time was spent in the fabric washing and drying departments, and then the impregnating stage was reached; and after that the cutting and topping, the fixing, the branding, the sewing, the modelling, the burning-off, shaping, and seasoning, and the collodionizing were witnessed. At every step there was something of interest to see—so much so, in fact, that not the lightest task of the guides was to keep their respective parties together, by whipping-in stragglers who displayed a tendency to linger too long at one particular spot. And this desire to lag was not invariably in connection with the machinery. The marvellous dexterity of the workers—all women and girls, and exceedingly well trained—was also a wonder to men who fumble over the daily task of lacing-up a pair of boots.

When the mantle is made, the work at the factory is by no means complete; for the packing itself is an art, and is preceded by another important operation. Every single mantle made by the Welsbach Company is thoroughly examined by experts before it is packed, and all but the perfect are rejected. In addition to this, mantles of every type being made, and representative of batches going through the works, are tested several times a day, both before and after collodionizing. The tests used in each case are far more severe than any to which a mantle would be subjected in ordinary use. Of the factory itself, it may be said that it is a model one in every respect—no pains having been spared to promote the comfort and welfare of the workers.

At the conclusion of the inspection, conveyances were in waiting to take the members to the Connaught Rooms, to meet the Chairman of the Company, with whom they dined, and who manifested his interest in the Association by remaining with them throughout a pleasant evening.

Mr. J. R. YATES said that, as the Chairman of the Welsbach Company, it was his pleasure to extend to the Association a very hearty welcome. He had received a telegram from the General Manager (Mr. Harold Talbot) regretting his inability to be with them. He (Mr. Yates) understood it was the first time the Association had visited the Company's works; but he hoped that what they had seen had so much interested them that some day they would come again. The great advantage of occupying a junior position was that those who did so had a splendid opportunity of looking forward; and this he thought was a better thing than looking backward. He hoped that in due course all those present would occupy the higher positions to which they were doubtless aspiring.

The PRESIDENT remarked that they had had a most interesting afternoon, and had examined machines such as they had never seen before. There was no doubt that the Welsbach Company made mantles in a most efficient manner.

Mr. H. W. KERRIDGE proposed a hearty vote of thanks to Mr. Yates, Mr. Bark, the members of the staff who had assisted, and the Welsbach Company, for all they had done to make the visit a success. He expressed the opinion that, if the matter were approached in a proper spirit, there was no reason to fear for the future of the lighting load. They would keep it in the face of the keenest competition. With mantles such as the Welsbach at hand, there was every incentive to them to go ahead.

Mr. E. L. OUGHTON seconded, and remarked upon the admirable general lay-out of the works, and the absence of reticence on the part of the staff during the visit.

Mr. S. B. CHANDLER, in supporting the vote, emphasized the "all-British" character of the Welsbach Company. All the employees, he pointed out, were British, and so was all the money that was in the Company. It was imperative that they should all as far as possible support home industries, and thereby reduce the great amount of unemployment. The imports of mantles from foreign countries were colossal; and this was very regrettable. Mr. Kerridge had made a "fighting speech," and this was the spirit prevailing throughout the Association. They stood for a great industry, and they did not for one moment consider that gas for lighting was a "dead-letter."

Mr. B. BARK, replying on behalf of the staff to the vote (which had been heartily accorded), said it had been an unusual experience to have such piercing questions asked as those which had been put by the visitors that afternoon; but he had told his staff that there was nothing to hide, and that all queries should be answered. The inspection had been a great pleasure to every member of the staff, because they had felt they were showing round people who took a real interest in what they saw.

Mr. YATES also acknowledged the compliment, and remarked that he would suggest to them as a slogan: "Keep the gas-fires burning." That the Welsbach Company was all British was perfectly true. No worker in the factory was other than British.

ACTION OF NITRIC ACID ON COAL.

An Abstract of the Results of an Investigation by A. V. Hendrickson.

Last June we gave an abstract of research work undertaken by Mr. A. V. Hendrickson on the action of nitric acid on coal [*vide* "JOURNAL" for June 6, p. 592]. Since that date further experimental data have been obtained; and the inferences drawn from this additional investigation have been published in the current issue of "Fuel in Science and Practice."

As before, the tests have been confined to gas coals—this time being applied to a series of coals from Somerset. The earlier experiments showed some vague connection between the volatile matter content, the increase of temperature on treatment of the coal with nitric acid, and the increase in weight on evaporation with nitric acid. The results given were not calculated to a dry ash-free basis; and on recalculation to this standard the relationships appear still more vague. Comparing two Somerset coals giving approximately the same percentage of volatile matter, there is a difference of 5° C. in the temperature obtained at the end of five minutes on stirring with nitric acid, and a difference of 8·5 p.ct. in weight on evaporation. The author has not yet met with an instance where the change in weight was a negative quantity; neither can Boudouard's conclusion, that the evolution of heat is greater the greater the volatile matter content of the coal, be confirmed.

The increase in temperature when nitric acid is added to coal is probably due to the joint action of nitration and oxidation, which under the conditions of the experiment reaches its maximum in five minutes. At the higher temperature of the evaporation with nitric acid, these reactions are modified, and their relative importance is altered. Further, the gaseous products from the two treatments are not the same with the same coal. The gaseous products also differ with the different coals, and the colours of the products vary. Therefore, states the author, the results obtained by the action of nitric acid on coal must be governed by the constitution of the coals, not only as regards the ulmin content of the latter, but also as regards the relative proportions of the banded constituents present. Experiments were carried out on these banded constituents; the mean figures for each being given in the following table.

Mean Figures (Dry, Ash-Free).

—	Fusain.	Durain.	Clarain.	Vitrain.
Volatile matter, p.ct.	19·8	34·8	35·5	33·8
Fixed carbon, p.ct.	80·2	65·2	64·5	66·2
B.Th.U. per lb.	14,793	14,873	14,519	14,490
Addition of nitric acid—				
Start, °C.	15·6	15·6	15·6	15·6
1st min.	22·2	29·9	30·9	31·7
2nd ,,	22·8	31·6	33·9	34·7
3rd ,,	23·2	32·5	35·3	36·0
4th ,,	23·4	33·0	36·1	36·8
5th ,,	23·5	33·3	36·6	37·3
Total increase in temperature	7·7	17·7	21·0	21·7
Evaporation with nitric acid; increase in weight, p.ct.	14·2	28·4	28·1	28·6
Fixed carbon / Volatile matter	4·0	1·9	1·8	2·0

It will be seen that the values for the volatile matter content and for the rise in temperature on the addition of nitric acid, and the increase in weight on evaporation show no correlation with each other or with the corresponding figures for the other banded constituents. While fusain, durain, clarain, and vitrain from the same coal may be distinct and show distinct variation in chemical and physical properties, this generalization does not indicate that similar banded constituents from other sources will exhibit the same characteristics. From a practical and analytical point of view, this is a disappointing fact, for it was hoped that the action of nitric acid would lead to developments of a quick method for the differentiation of coals used in manufacturing operations.

WALES AND MONMOUTHSHIRE JUNIOR GAS ASSOCIATION.

Some Aspects of Gas Lighting.

A General Meeting of the Association was held at Cardiff on Saturday, the 1st inst., when Mr. T. A. CANNING (the President) was in the chair.

Mr. J. W. LOFTS (of Messrs. William Sugg & Co., London), who received a hearty reception, delivered a lecture on "Some Aspects of Gas Lighting," which he illustrated with lantern slides. He emphasized the necessity of scientific construction of gas-burners, pointing out the absolute need of calibration of parts, in order that the mixture should be injected to the nozzle under the best conditions for combustion. From this aspect, he explained the construction of the different parts of burners, and afterwards showed the effect obtained in flame formation with a correctly designed inverted burner. He brought to notice, by means of polar-curve diagrams, the illuminating power of different types of burners, and explained the design and construction of the superheater, as well as its theoretical principles.

The lecturer dealt with street lighting by means of conversion sets for existing lanterns, and paid special regard to outside shop lighting with automatic control. He drew attention to the desirability of giving the consumer the same advantage of being able to switch on his lights as with electricity. Several devices were mentioned, which amply fulfilled this requirement, for shops, public halls, and places of worship.

Many illustrations were shown of successful installations of gas lighting which have recently been fitted in railway stations and other public places. It was also mentioned that for council school lighting special types have been designed, in order to overcome objections raised, with the result that many schools in the country depended upon gas lighting for illumination and the authorities expressed every satisfaction with the results.

Discussion.

The PRESIDENT, proposing a hearty vote of thanks to Mr. Lofts for his lecture, remarked that it had been very intellectual and instructive. Mr. Lofts had come from London to give the Association the benefit of his wide experience and deep knowledge. He had told them a great deal that they did not know before, and they had learned more from him in one afternoon than they could have gleaned from many months' study of various text-books on the subject. Mr. Lofts' remarks had assured them that gas lighting was not doomed, and that it had a very great future before it. He (the President) condemned the cheap burner, which was extravagant, non-lasting, and inefficient. This also applied to cheap mantles, which were poor in quality, used more gas, gave a bad light, and were absolutely unreliable. For these faults, gas companies were often unjustly blamed, instead of the makers of the shoddy apparatus.

Mr. T. E. FRANKLIN (Barry), who was welcomed to the meeting by the President, seconded the vote, and said it had been a great pleasure to hear Mr. Lofts, who had rendered considerable service to the industry as far as lighting was concerned. He agreed with the lecturer in his statements that the industry did not thoroughly appreciate the points of correct illumination.

Mr. A. H. SHEPHERD (Swansea) spoke of the necessity of supplying mantles suitable for the burners they sold. Much harm was done by cheap mantles which did not fit the flame, and consequently were the cause of complaints. He found that it was advisable to secure the interest of the retail traders in this matter—particularly the small dealer, who would otherwise be tempted to sell inferior goods, as he was not interested in efficiency. In Swansea, they sold mantles to retailers.

Mr. B. J. BELL (Cardiff) stated that the lighting of several schools had been altered, with gratifying results. It was found that the illumination had been considerably improved, and the consumption of gas very much reduced. Adequate illumination was a complicated problem, which in many cases had not received the attention to which it was entitled. Often lights were installed without taking into consideration whether the point was in a correct position. There was no doubt that for church lighting, which had been mentioned by Mr. Lofts, gas was very efficient. The question of distance control was one which should receive careful attention, as this convenience was vital when deciding upon installations in public places.

Mr. F. MARSH (Lighting Superintendent, Cardiff Corporation) said that, as far as street lighting was concerned, he was satisfied that the twin burner was very efficient in use.

Mr. LOFTS, acknowledging the vote, declared that it had given him great pleasure to address the meeting, and he intended to have the information printed for distribution among the members.

From Natural to Manufactured Gas.

Last winter, because of depletion in the natural gas supply at Elmira (N.Y.), manufactured gas was substituted; and this winter, for the same reason, manufactured gas will be similarly substituted at Ashtabula, Conneaut, Geneva, and Jefferson, Ohio. At Louisville (Ky.), after many years of satisfactory service, the natural gas supply is no longer equal to the city's requirements; and a manufactured gas plant of large capacity is being constructed to meet the demand of the coming winter and thereafter. Again, the supply of gas passing from West Virginia and Ohio into Indiana has been depleted to such an extent that on Aug. 1 of this year the discontinuance of natural gas and the substitution of manufactured gas took place in Indiana at Muncie, Anderson, Alexandria, Fairmount, Hartford City, and Marion. Richmond and New Castle (Ind.) are to discontinue next year, and construction work on manufactured gas plants at these places is already well under way. The Indiana towns of Winchester, Union City, and Portland have also successfully substituted manufactured gas for the natural product. In placing these facts before the Ohio Gas and Oil Men's Association convention, Prof. D. J. Demorest, of the Department of Mines and Metallurgy at the Ohio State University, pointed to the advantage, where the supply is falling short, of conserving the remaining natural gas supply, by using it only as an enriching agent of raw material in the manufactured gas industry. This gives no great difficulty, and has been done in a number of places. A gas appliance that has been designed to use natural gas will not necessarily be suitable, as it stands, for manufactured or mixed gas; but it has been found that the changes and adjustments necessary are easily made and inexpensive. It is quite possible that it will be necessary to instal in the larger towns a high-pressure distribution system with district pressure regulators, each regulator serving, perhaps, one square mile. There is no region in the world more advantageously situated for producing manufactured gas, so far as raw materials are concerned, than Ohio. In West Virginia, Kentucky, and Western Pennsylvania, is the finest gas coal in the world; while Ohio has an enormous amount of coal which, though not as high-grade as those just mentioned, with natural gas as an enriching agent it may be more profitable to use than the more expensive coals.

of the main when it was repaired the following day. One of the undamaged 36-in. mains carries gas at high pressure, and it may be well imagined that had it been smashed the difficulty of getting the situation under control in time to prevent a disastrous explosion would have been very great.

Discussion.

The CHAIRMAN said the paper dealt with a very important matter from the gas engineer's point of view; but there was an equally important one—viz., the condition of the roadways as affecting the gas-mains. With the increasing traffic, and the change in the methods of road construction, it was becoming, not only much more costly, but a much more difficult task, to trace escapes of gas which might arise from leaky joints or fractures of mains; and with the desire expressed in Mr. Bloor's paper on the part of the gas undertakings to do everything within their power to restrict leakages to an absolute minimum, it was essential that there should be the closest co-operation between all authorities responsible for the roadways, with the object of reducing the necessity for breaking up the road surfaces. If timely warning were given to the gas undertakings, then the necessary steps could quickly be taken to deal with the matter, and so prevent the possibility of danger to life through explosion or through the escape of gas. The Board of Trade had recently endeavoured to bring into closer contact those authorities, with the view of formulating schemes which would assist directly the gas undertakings, and incidentally the whole community, by collective action and by closer relations. This was a matter of as much importance to the gas industry and to the general community as the question of the position of mains in the roads.

Mr. W. J. LIBERTY (City of London) said the roads to-day were very different from what they were twenty years ago. In the large towns and cities there were reinforced concrete roads 2 ft. in thickness underneath the wood or asphalte. Thus the roads were really hermetically sealed, and what took place under them in the way of leakages of gas or water was an unknown quantity until something happened, and then it might be found that the mains had been leaking for a considerable time. This was specially to be borne in mind in the case of gas-mains, because, when a leakage occurred under a hermetically sealed road, the gas, after a time, would be drawn into a warm cellar or basement, and find its way into a building and do a great deal of damage. Another point of great interest in regard to mains was the question of obstruction. He exhibited some photographs showing the obstruction in central London while mains were being laid, and made special reference to a photograph of Ludgate Circus. In that particular case the Post Office were laying some 53 ducts down Ludgate Hill to Ludgate Circus, and estimated originally that the work would take three months. As a matter of fact, it took over a year, and the cost was two-thirds more than had been estimated, all on account of the obstructions met with in the ground. The author had mentioned that there were 9 miles of subways in the London County Council area, and about 2 miles in the City of London; and these subways had been of the utmost value. The subways running up the Commercial Road, Victoria Street, and up to Westminster and the Houses of Parliament, housed 48-in. and 36-in. mains in an admirable manner. It was impossible now to have subways of this character under the old roads, because of the heavy cost; but wherever the London County Council made a clearance and built new roads, it was the policy to construct a subway. Another danger with regard to mains in places like London was the possible effect of the building of the tube railways many feet below the surface. The South Metropolitan Gas Company found this out in connection with the extension of the City and South London Railway to Clapham. They got into a pocket of this sand, which let their mains down. The London Gas Companies had since obtained parliamentary powers to protect themselves against this sort of thing. With regard to ordinary surface work, the closest co-operation was necessary between borough surveyors and engineers and the gas authorities. Wherever it was possible to make a subway, he was in favour of it. He had had charge of subways for many years, and was convinced that they had proved their utility and cheapness to those who laid their mains in them.

Councillor A. H. COLLINS (Salford) disagreed with the author in saying that it was a secondary consideration whether the mains were laid close to the surface. He was Chairman of the Highways Committee at Salford, and nearly all the traffic from the Manchester Ship Canal to Lancashire went through there. The various mains in Salford were laid some years ago at a depth which was sufficient for those days; but as a result of such a continuous stream of heavy traffic over the roads the gas and water mains were breaking at the rate of one per week, and a constant supply of men to repair the breakages had to be maintained. The obvious suggestion, of course, was that the mains should be re-laid; but the Canal Company were altering the whole of their inlet and outlet gates. When this was done, it was proposed to take up the roads, and sink the pipes considerably lower. It had been found necessary to go to a depth of 4 ft., and then put 18 to 24 in. of concrete on top, to protect the mains from this heavy traffic. Otherwise leakage took place.

Mr. LACEY: Was the foundation on which these mains were laid in the first place a solid one?

Mr. COLLINS said the soil had not been disturbed for two or three hundred years, and it had to be dug up with picks. It was as difficult to break up as concrete.

Mr. B. R. PARKINSON expressed the wish that the popular Press should get hold of the figures which Mr. Lacey had given, because they showed what real assistance the gas industry was giving to road transport. In the case of the three Metropolitan Gas Companies, the weight of the gas distributed amounted to one million tons per annum, whereas four million tons of coal per annum would have to be transported if gas were not available. He wished the paper had been a little longer, for there were many things which might have been dealt with. One would like to have had from the author a description of his ideal road, with the best positions for the gas, water, electricity, and other mains, apart from the question of subways. There might also have been some reference to electrolysis in connection with tramways. The reference to the new roads that were being constructed was also interesting, because this was a source of great trouble to gas engineers who, having laid their mains years ago in some secluded footpath or track at the side of the road, might find them perhaps only 6 in. under the surface of these new roads. In these circumstances, happy was the gas engineer whose mains were of steel. Steel pipes were absolutely unbreakable, and offered better facilities for jointing. They could be laid in long lengths, because of their resiliency. In case of subsidence, they held up the road, instead of snapping. Fewer joints were needed, and steel offered the greatest possible resistance to the effects of heavy traffic, and thus reduced the leakage account. High-pressure gas was nearly always distributed in steel mains. Why should not low-pressure gas be distributed in this way? Moreover, welding was possible with steel mains, making a continuous length. There was, of course, the danger of corrosion, both external and internal. Corrosion, however, not only affected steel mains, but also the wrought-iron services which supplied gas to the houses. It also affected the holders and other gas-plant; it was not a matter which should be allowed to prejudice their minds against the use of steel for gas-mains.

Mr. E. WORRALL (Stretford Borough Engineer) said that from the point of view of London traffic the saving of the transport of four million tons of coal per annum, referred to by the author and the previous speaker, was infinitesimal. In his own suburban district of a northern city he carried a tonnage of between 5 and 6 million tons a year over one road alone. He did not think it could be claimed that gas companies served a really useful purpose in diminishing the traffic problem. A matter of interest was the detection of leakages under sealed roads, to which reference had been made. He believed that there was a method of detection by means of which leakages could be closely located. A small 1-in. pipe was carried from the sockets to the surface; the idea being that the leak would find the path of least resistance. Something was certainly required to prevent the breaking up of lengths of road to find leakages. He was disappointed that the author, who must have had great experience in reference to all these matters, had not given a strong lead in the direction in which a solution might be found. He did not follow the author in the part of the paper in which he said that, though at first one main might have to suffice for a road, eventually there should be two mains—one on each side; thus the breaking-up of the road for individual services would be avoided. The point was that when the first main was laid, it would be necessary continually to break-up the road to serve the houses on the other side. Thus, though when there was a main on either side it would not be necessary to break-up the centre of the road, most of the breaking-up would already have been done.

Alderman MUIRHEAD (Liverpool) spoke of the difficulties involved by so many statutory authorities opening the roads, but added that the complaints of the public were often made in ignorance.

Mr. S. CHANDLER (Tottenham) said that Mr. Lacey was to be congratulated upon the manner in which he had dealt with the subject. From the point of view of gas undertakings, roads had, of course, very special interest; and the great improvement in surfaces, the use of hard wood blocks, concrete, expanded metal mesh, and reinforced materials now forming their construction, made the matter of great moment, especially to the distributing engineer. It was interesting to note Mr. Lacey's calculations as to the effect of the underground supply of gaseous energy, and to realize the considerable saving in wear and tear to road surfaces by the transmission of gaseous energy in a manner which did not interfere with conditions above the surface. This was a point which brought home the valuable character of fuel supply by pipes. Modern practice was in the direction of mains being laid under footpaths or walks, for the reasons given, together with ease of repair, less disorganization of traffic, and, what was equally important, lessened vibration, and absence of the very heavy pressures now common on all main roads. Heavy weights on road surfaces were now general; and the case for mains under paths could not be in dispute. It would seem, however, that footpaths generally were already occupied by telephone, telegraph, and electricity services, the various jointing and junction boxes of which often made it difficult to find accommodation for mains and services. The policy of the Post Office in converting overhead lines to underground conduits did not help gas and water interests; but this condition of affairs was unavoidable, and must be contended with. In many, if not all, instances where new road construction was undertaken, it was necessary to overhaul and put into repair the mains and services, and possibly to divert—certainly to examine—joints, strip services, and relay in pitch and troughing. The expenditure involved—which, were disturbance not taking place, would be unnecessary from the undertaker's point of view—was heavy; and it did not seem reasonable that the onus of this cost should be thrown upon the gas and public service companies. Taxes obtained from private and commercial motor vehicles were, he believed, partly allocated to new road construction, which included re-conditioning of all mains and services under them. The co operation of road authorities and public service undertakings owning mains under the public thoroughfares was very desirable; and previous notification of alteration, re-paving, &c., was necessary, so that opportunity could be given to the main owning bodies to carry out any work rendered necessary by the local authority's requirements.

Mr. LACEY, replying to the discussion, said the conditions in the City of London, referred to by Mr. Liberty, were to some extent unique. As to the point made concerning the difficulty of locating leaks in hermetically sealed roads, the fact was that these roads made it easier to locate leaks, because even a small escape found its way into the Post Office boxes and pits under the footways where the men were working, and consequently were quickly reported. He had been taken to task with regard to his statement concerning the depth at which mains should be laid. He had not stated that the depth was not a factor, but that it was not the chief factor. On this point Mr. Sandeman, the Distributing Engineer of the Croydon Gas Company, had sent the following note, which was a striking confirmation of this:

> In his paper, Mr. Lacey states: "It would appear reasonable to assume that the greater the depth at which a main is laid the less the risk of damage by vibration or other causes. But this assumption is not borne out by experience." In confirmation of this, we have during the last twelve months relaid about 500 yards of 5-in.

main which was originally laid in 1863 with a cover varying from 4 in. to 1 ft. The road is one on which there is a fairly constant stream of heavy traffic; and I do not remember ever having to attend to any leakage on the main. When we examined the main we found the pipes in such an excellent condition that we relaid them at a greater depth, so as to ensure the service pipes having a sufficient fall.

This experience, continued Mr. Lacey, certainly agreed with his own—that if mains were laid shallow, but were well laid and in solid clay, they would carry heavy traffic without leakages. On the other hand, even if the mains were at a depth of 3 or 4 ft., but were in a bad foundation, they would give trouble; and he had known cases of this where mains had been laid deeper. Mr. Parkinson had referred to the controversial question of cast-iron *versus* steel mains, and had mentioned that the great objection to steel mains was corrosion. Corrosion was all-important. There had been a hundred years' experience of cast-iron mains, and it was known that in normal circumstances cast-iron pipes would last indefinitely. Experience with wrought-iron service pipes, on the other hand, did not encourage the wholesale adoption of steel without knowing more about it. One of the advantages of steel was that it could be used much thinner. Steel mains were only about a quarter the thickness of cast-iron mains; and from the point of view of corrosion this was a disadvantage. It had been stated that the paper did not put forward a definite solution to main-laying problems. He did not think there was any definite solution. At the same time, his view was that, where new roads were being constructed, the place for all mains was under the footpaths. These new roads were, generally speaking, wide, and in these circumstances the mains should not give any trouble. Reverting to Mr. Liberty's remarks and his recommendation to construct subways wherever possible, the trouble was that where it was feasible to put a subway the cost was often not justified, while where it was necessary the cost was prohibitive. Mr. Worrall must have misunderstood the paper on the point of having mains on either side of a road. What he meant was that in the case of roads of (say) 25 ft. or less in width, there need only be one main, but that when the road was altered a second main could be laid for the other side, to avoid the breaking-up of the new and finished road later for laying services. The suggestion to locate leakages more easily by running a small pipe from the back of every joint to the surface seemed to him to be impracticable, because he did not think highway engineers would be very enthusiastic about having a few more million surface boxes in the roads. In the case of the Gas Light and Coke Company, there were 2700 miles of mains; and if that were multiplied by the number of joints per mile, it would be seen that there would be a good few surface boxes to maintain and look after! As a matter of fact the escapes of gas under hermetically sealed roads in London were very much more easily found than they used to be. The surface of the roadway was an important factor in damage to mains; and for this reason gas engineers were indebted to highways engineers for the manner in which road surfaces had been improved in recent years.

A hearty vote of thanks was accorded the author of the paper.

THE PHENOLIC CONSTITUENTS OF VERTICAL-RETORT TAR AND LIQUOR.

An Extensive Research in Australia.

IN the "Journal of the Society of Chemical Industry" has been published the first part of research work on vertical-retort tar carried out by G. S. Curry, of the Australian Gaslight Company, Sydney, N.S.W. The work deals with an important question in an exhaustive and thorough manner; and a few abstracts of some of the main results obtained, and conclusions drawn, will be of undoubted interest to readers of the "JOURNAL."

The investigation described in the paper was undertaken with the object of discovering the cause of a red-brown colouration imparted to the water of the Parramatta River, round the Mortlake Gas-Works. As this colouration was most marked in the vicinity of the discharge pipe for the spent liquor from the ammonium-sulphate plant, it seemed probable that this liquor was the main cause. It was therefore examined to find if any substances were present which underwent oxidation on exposure to air. The liquor in question consists of a mixture of the ammoniacal liquors obtained from both vertical and horizontal retorts; and consequently samples of each kind were examined separately. From the results obtained it was proved conclusively that the colouration was due to the presence of polyhydric phenols in the vertical-retort liquor; negative results being obtained with that from horizontal retorts.

These polyhydric phenols occur in vertical-retort liquor to the extent of approximately 0·05 to 0·10 p.ct. by volume, and consist principally of catechol. A methyl ether is also present in small quantity (possibly guaiacol, catechol monomethyl ether); and small quantities of resorcinol and trihydric phenols also appear to constitute part of the mixture. It is of interest to note the method adopted in carrying-out this research. To secure sufficient material for an extended examination, about thirty-two gallons of ammonia liquor were concentrated to a small bulk, acidified, and extracted with ether. In this manner about 700 cub.cm. of crude phenols were obtained. This mixture was distilled, with the following result: Up to 130° C., the distillate consisted mostly of water containing a little oil in suspension; the temperature then rose rapidly to 250° C., very little distillate being obtained; at 250° C. the temperature remained almost constant till nearly all had distilled. The distillate, a yellowish oil, was again distilled; the main portion coming over at about 250° C. as before.

The distillate consisted of a light yellow oil, which, on standing, gradually deposited a white solid. Tests indicated that dihydric phenols were present in the mixture. The solid portion was again distilled; and its properties, and its behaviour towards alkalis, ferric chloride, ammoniacal silver nitrate, and nitric acid showed it to be catechol. Further tests on the liquid portion proved the presence of trihydric phenols; and the presence of resorcinol was inferred from the fact that, on fusing a portion of the oil with phthalic anhydride, a brown substance, similar to fluorescein, was obtained.

THE PHENOLS IN VERTICAL-RETORT TAR.

It is shown that the phenols in the tar produced by the carbonization of coal in Glover-West vertical retorts are similar in nature to those occurring in horizontal-retort and coke-oven tars, but that the content of phenol is much smaller, α and β naphthols are absent, and small quantities of polyhydric phenols are present. (These substances do not appear to occur in horizontal-retort and coke-oven tars; they are evidently destroyed by the greater heat to which the products of carbonization are subjected before leaving the retort.) Though there are only very small quantities of polyhydric phenols present in vertical-retort tar, it has been shown in the research that they are the cause of the coloured emulsions obtained when a disinfectant oil made from vertical-retort tar oil is added to water (disinfectant oils made from horizontal-retort or coke-oven tar oils give white emulsions with water), and the red colouration observed when vertical-retort tars are washed with alkaline liquids.

DISINFECTANTS MADE FROM VERTICAL-RETORT TAR DISTILLATES.

From a further study of the polyhydric phenols which cause the coloured emulsions, the author is able to put forward an explanation of why the emulsions vary in colour from pink to purple: On making-up a vertical-retort tar oil into a disinfectant oil (*i.e.*, by the addition of a suitable emulsifying agent, such as castor-oil soap or resin soap), and subsequently adding a portion of the emulsified oil to water, a slightly alkaline liquid is obtained—the alkalinity being due to partial hydrolysis of the soap in aqueous solution—which soon assumes a pink, slatey-blue, or purplish colour. These colourations have been found to be due to the presence of catechol in the oil; very small quantities of this phenol, in slightly alkaline solutions, causing the pink colouration, which darkens as a result of oxidation. If, on adding a portion of the emulsified oil to water, a slatey-blue coloured emulsion is obtained, it shows that the oil has, at some stage, been in contact with iron; the variation in, and intensity of, the colour depending on the quantity of catechol present, and also on the degree of alkalinity of the emulsion obtained on addition to water.

SUMMARY OF RESULTS.

From the data obtained in the research the composition of vertical-retort tar acid is probably as follows:

(1) *Monohydric phenols* (series $C_n H_{2n-7} OH$)—phenol, cresol, xylenols, trimethylphenols, tetramethylphenols, naphthol homologues, hydronaphthols, phenols of hydroanthracene and of other high-boiling hydrocarbons. *Polyhydric phenols* (series $C_n H_{2n-8} (OH)_2$ and $C_n H_{2n-9} (OH)_3$)—catechol, resorcinol, pyrogallol. A methyl ether (possibly guaiacol) is present in the mixed phenols occurring in the ammonia liquor. The presence of phenol was proved. In the cresol fraction, *m*- cresol was identified; but the main portion of the fraction appears to consist of *p*- cresol, while *o*- cresol is only present in traces. Of the xylenols, *o*- xylenol was identified.

(2) The approximate composition of vertical-retort tar acids is as follows:

Component.	P.Ct. by Volume.		
	Phenols.	Distillate.	Water-Free Tar.
Phenol	4	1·2	0·60
Cresols	23	6·9	3·45
Xylenols	22	6·6	3·30
Higher phenol homologues and polycyclic phenols	50	15·0	7·50
Polyhydric phenols (mainly catechol)	1	0·3	0·15
	100	30·0	15·00

(3) Disinfectants producing pure white emulsions can be obtained by carefully fractionating vertical-retort tar distillates through an efficient fractionating column, rejecting all oils boiling above 230° C.

"Journal" Subscriptions from our Dominions.—From January next, we have decided to reduce the subscription to the "JOURNAL" delivered in our Dominions and Colonies to 35s. a year. We are thus placing subscribers in the Dominions on precisely the same basis as those at Home. It will, of course, be understood that, at this rate, all subscription payments must be in advance.

MANCHESTER AND DISTRICT JUNIOR GAS ASSOCIATION.

Visit to Messrs. Galloway's (Ltd.) Boiler Works, Manchester.

On assembling at the works (which were established about the year 1867, and are now very extensive) last Wednesday afternoon, the members were received by Mr. Ashton (the Works Manager) and Mr. Orme (Works Superintendent), who, along with Messrs. Murdock, Hayes, and Robinson, conducted them through the various departments.

Many processes were seen; and particular interest was taken in the plate edge planing machines, huge bending rolls, acetylene cutting, planing of circular plates, drilling machines, annealing pots, furnaces for plates, &c., making of shells for "Sentinel" steam wagon boilers, gas welding, large pumping engines, and hydraulic plant. In one of the workshops was a five-drum water-tube boiler of an evaporative capacity of 40,000 lbs. per hour, and a heating surface of 4800 sq. ft. After viewing the works, the members were invited to take tea, which was served in the works canteen.

Mr. W. H. BATTERSBY (Bury) moved a vote of thanks to the firm, and remarked that Messrs. Galloways carried out each process in a workmanlike manner. He had been very interested in the various improvements they had attached to many of their machine tools. He paid a high tribute to the guides, who had fully replied to the numerous questions asked.

Mr. H. E. STONE (Birkenhead), who seconded, thought all had appreciated their visit that afternoon. It was not yet possible to run gas-works without steam plant, so that it was necessary for the gas engineer to know something about platers' and smiths' work. He added his own personal thanks to the guides, and to the firm for their kind hospitality.

The PRESIDENT (Mr. J. H. Clegg) said that on a recent visit to a coke-oven works in the steel-producing area he saw a 6000 H.P. gas-engine made by the firm they were visiting. He had also read a paper by Mr. Pilling (the General Manager), and thought then that Messrs. Galloway's was a works one should see.

Mr. ASHTON (Works Manager), in acknowledgment, declared that it was a pleasure to have the Association there. Steam-engines, as well as large gas-engines, were made by the firm; but that department was at Knott Mill. Perhaps at some future date there would be an opportunity of seeing this other plant. The qustions asked showed clearly that the members of the Association were technical men.

Mr. C. H. BAMBER, B.Sc. (Bolton), then read a paper, the main portions of which are produced below, entitled

SOME NOTES ON WASTE-HEAT BOILERS.

In putting these notes before you it is not my intention to pose as an authority on this subject, but rather to submit to you a collection of facts and data in connection with the much-debated question of the advantages and disadvantages of waste-heat boilers.

In raising steam by solid fuel, by far the greater portion of the heat is transmitted to the water in the boiler by radiation from the incandescent fuel and gases; whereas in waste-heat boilers most of the heat has to be transmitted by convection and conduction from the gases, and only a small percentage by radiation. The reason for this is, of course, that the usual industrial waste gases are not sufficiently hot to radiate much heat. Since the transmission of heat by radiation varies roughly as the fourth power of the absolute temperature, it will be easily understood that there cannot be much transmission of heat by radiation from waste gases at an average temperature of 1200° Fahr. compared with a solid fuel fired boiler with a grate temperature of 2700° Fahr. The rate of transfer by radiation would be 16 times as great in a solid fuel fired boiler as in a waste-heat boiler of the same type using waste gases at 1200° Fahr. The ratio is even greater when the more accurate formula $\frac{T_1^4 - T^4}{T_2^4 - T^4}$ is used, where T_1 = temperature of solid fire, T_2 = temperature of waste heat, and T = temperature of firebox.

In a solid fuel fired boiler of the ordinary type (such as a Lancashire boiler) approximately 60 p.ct. or more of the heat absorbed by the water is radiant energy. Hence such a boiler, being designed for utilizing radiant heat, would not be efficient for waste-heat recovery, for it would only absorb about 4 p.ct. of the heat by radiation from waste gases at 1200° Fahr. If the waste gases are at a high temperature (over 2000° Fahr.), the use of the ordinary boiler becomes practical. This accounts for the comparative success of many 3 and 5 flued Lancashire boilers used in conjunction with waste-heat bye-product coke-ovens.

The waste-heat boiler of chief interest to the gas engineer is one which is capable of efficiently utilizing waste gases at about 1200° Fahr., or less. This boiler has to absorb all its heat by convection and conduction, and hence is of different design from the ordinary solid fuel fired boiler. There are two chief ways of designing waste-heat boilers. One method is to use a boiler of the water-tube type. The other is to use a large number of small diameter fire-tubes, round which the water circulates and through which the hot gases sweep rapidly.

The water-tube boiler, if carefully designed, can be made highly efficient. Since it is desirable that the gases should strike a large number of tubes at right angles, this boiler must consist of a large number of small tubes placed in the line of travel of the hot gases. The area between the tubes must be suitably proportioned to give a velocity of flow which will ensure a maximum heat transfer to the water, while not obstructing the flow of the gases. The ordinary type of water-tube boiler is only fairly suitable. There is not a sufficient number of tubes for the gases to strike in their passage through the boiler, unless they are redirected by baffles. Also, for maximum efficiency, the space surrounding the water-tubes should be enclosed, not in a brick setting, which may give rise to losses by radiation, but in a water-containing shell, which may thus put to effective use any heat which would otherwise be radiated. Both the interior and exterior of the water tubes should be easily accessible for cleaning purposes. The tubes should be arranged to permit free circulation of water and a free passage for the steam generated.

A successful boiler of this type (used by Messrs. West's Gas Improvement Co., Ltd.) has been designed by Messrs. Galloway's, Manchester. It consists of an annular circular shell in one or more sections one above the other, with a number of small water-tubes arranged across the inner circular shell in such a way that the gases are split up, and strike the tubes in succession, giving an efficient heat transference, with little, if any, obstruction of the flow of gases. The water is contained in the annular chamber, and circulates freely through the tubes, which are slightly inclined to the horizontal, and allow the steam to escape easily. The tubes are readily accessible; each set of tubes or the whole of the outer shell may be removed for cleaning the inner shell. The outer side of the tubes is easily accessible for removing flue dust, &c. One disadvantage lies in the large number of joints.

Boilers of the second type are well represented by the "Kirke" waste-heat boiler, manufactured by Messrs. Spencer Bonecourt. This consists of a horizontal cylindrical shell with a large number of small-diameter fire-tubes traversing the boiler from end to end. Inside these the gases travel rapidly, and so in a very efficient manner are made to give up their heat to the water surrounding the tubes. It is possible so to reduce the temperature of the exit gases leaving that it is but little above that of the water in the boiler. To maintain the high velocity in the tubes, induced draught is necessary. The fire-tubes are easily accessible for cleaning; but, owing to their great length and the nature of the deposit formed, they are somewhat difficult to clean. The outer, or water, side of the tubes is not easily cleaned; and it is necessary to add a good boiler preparation to the feed water, to ensure clean tubes.

The most prominent source of waste heat to the gas engineer is the waste gases from the retort-setting. There are other sources also—viz., in the blow gases from water-gas plants, in the exhausts from large gas-engines, and from batteries of solid fuel fired boilers.

Let us consider the waste heat from a modern setting of vertical retorts using full regeneration, and estimate the amount of heat available as waste heat.

Consider the carbonization of 1 ton of coal.

Coke supplied to producer (15 p.ct. of coal carbonized), 336 lbs. —representing in pure carbon (assuming 12 p.ct. ash), 296 lbs. In practice, the average temperature of the waste gases from the setting is about 1200° Fahr.

Analysis of Waste Gases.

		P.Ct.	
	CO_2	18·2	
	O_2	0·5	
	CO	*Nil*	
	N_2	77·2	
	H_2O	4·0	
or	CO_2	26·2	by weight.
	O_2	0·5	
	N_2	70·9	
	H_2O	2·4	

Assuming that all the heat is extracted from these gases down to 400° Fahr., it is possible to find the heat available.

The average specific heat of the waste gases from 400° to 1200° Fahr. = 0·2498.

The heat available for steam raising

= weight of gases × specific heat × temperature interval

= weight of carbon burnt × $\frac{44}{12}$ × $\frac{100}{26{\cdot}2}$ × specific heat × 800

= 4142 × 0·2498 × 800 B.Th.U. per ton of coal carbonized

= 827,737 B.Th.U.

Assuming 85 p.ct. efficiency of boiler, this equals $827{,}737 \times \frac{0{\cdot}85}{970}$

[970 = latent heat of evaporation of water at 212° Fahr.]

= 725 lbs. of steam from and at 212° Fahr. per ton of coal carbonized,

or, 599 lbs. of steam from water at 50° Fahr. to steam at 100 lbs. per sq. in. pressure.

This equals 0·32 lbs. of steam from and at 212° Fahr. per lb. of coal carbonized, *or* 2·16 lbs. of steam from and at 212° Fahr. per lb. of coke burnt.

It is assumed in this case that no superheating of the steam takes place. If the steam is superheated, as is customary, the above figure will need to be reduced, according to the amount of superheat.

From a semi-recuperative setting there will be considerably more waste heat.

Temperature of waste gases, approximately 1600° Fahr.

Average specific heat 400° to 1600° Fahr. = 0·255.

Waste gases from carbonizing 1 ton of coal = 4142 lbs.

Heat available = 4142 × 1200 × 255 B.Th.U. = 1,267,452 B.Th.U. yielding, at 85 p.ct. boiler efficiency, 1110 lbs. of steam from and at 212° Fahr.

= 0·50 lbs. of steam per lb. of coal carbonized,

or 3·30 lbs. of steam per lb. of coke burnt.

Higher yields of steam than this can only be obtained by very poor regeneration in the setting, and a consequently higher temperature in the waste-gas flue, and by taking the temperature of the exit gases dangerously near to the temperature of the boiler. Settings should be run with a view to getting as good a heat balance as possible, and a waste-heat boiler used only to improve the figure. If it is possible to recover much larger quantities of waste heat than represented by the above figures, then the thermal efficiency of the retort setting should be improved first. The waste-heat boiler is a fairly expensive plant, and must not be installed merely to cure an inefficient retort setting. So far as present methods of securing efficiency in the operation of coal carbonizing plant are concerned, there is a fair amount of heat not recoverable by ordinary methods of regeneration. The secondary air only represents about half the bulk of the waste gases, and hence cannot use up all their heat. Suggestions of various kinds have been put forward for recovering the lost heat units; but so far the waste-heat boiler has proved the only practical method of achieving this object.

There is another calculation which may prove interesting. It can be proved that the maximum transfer of gases in a chimney takes place when the gases are about 600° Fahr. Hence there is no material benefit, in the way of removal of waste gases from a setting, by admitting gases to the chimney at a higher temperature than 600° Fahr. Also, all the gases may be efficiently removed from the setting even if they enter the chimney at 600° Fahr. If a boiler can be designed to utilize waste heat from a setting not reducing the waste gases below 600° Fahr., and without causing serious obstruction of the gases, natural draught may be used. Such boilers are usually of the water-tube type.

Let us consider how much steam is lost by taking the waste gases down to 600° Fahr. instead of 400° Fahr.

Average specific heat 400° to 600° Fahr. = 0·2411.

4142 × 200 × 0·2411 = 199,727 B.Th.U. per ton of coal carbonized, equivalent to $\frac{199{,}727 \times 0{\cdot}85}{970}$ lbs. of steam from and at 212° Fahr. = 175 lbs. of steam per ton of coal carbonized, *or* 0·53 lbs. of steam per lb. of coke burnt = 24 p.ct. of possible steam (1200° to 400° Fahr.). A "Kirke" waste-heat boiler, working on a regenerative setting of nine beds of four 5-ton Woodall-Duckham retorts carbonizing about 170 tons of coal per day with a temperature in the waste-gas flue of 1250° Fahr. generates about 4500 lbs. of superheated steam per hour from cold to steam at 70 lbs. per sq. in., and requires 19 to 20 H.P. to work the fan. Consider these figures. The producers are burning 15 × 170 tons = 25·5 tons of coke per day.

Thus the boiler is generating $\frac{4500 \times 24}{25{\cdot}5 \times 2240}$ lbs. of superheated steam at 70 lbs. per sq. in. per lb. of coke = 1·9 lbs. steam per lb. of coke.

Assuming 30 lbs. of steam from and at 212° Fahr. per B.H.P., the fan consumes 570 lbs. of steam per hour

= 0·25 lb. steam per lb. of coke

= 13 p.ct. (approx.) of steam generated.

Hence a fan requires a little more than half the steam it helps to generate by allowing the gases to be taken down to 400° Fahr. No doubt in larger units the fan is more efficient, and requires proportionately less power; but there is something to be said for the waste-heat boiler using natural draught. One only gains about 10 p.ct. more steam using a fan, and there is additional maintenance and uncertainty.

The writer has had experience of both steam and electrically driven fans; and of the two he prefers the electrically driven fan, which has proved more reliable, and requires less attention.

The following figures are for a horizontal fire-tube boiler using waste heat from a setting of twenty-four 7-ton Woodall-Duckham retorts, with only partial regeneration. The inlet temperature of the waste gases to the superheater is about 1500° Fahr., and the exit from the feed-water heater about 300° Fahr. The boiler evaporates about 6000 lbs. of superheated steam at 100 lbs. per sq. in. As would be expected, this boiler generates more steam than the "Kirke" boiler, since it is working on a setting which is only partially regenerative.

The use of a satisfactory waste-heat boiler enables a water-gas plant to supply most, if not all, of the steam required for its operation. In batteries of several units it is possible to have a surplus. A waste-heat boiler operating on a water-gas plant has a rather peculiar duty to perform. Practically all of its steam is generated during the blow; only a comparatively small amount being generated during the run, when the water gas is circulating through the boiler. In the case of the carburetted water-gas plant, in which the waste heat from the gas itself cannot be recovered economically, the whole of the evaporation must take place during the blow. Therefore, a high efficiency and a very high rate of steaming is essential. The type of boiler usually adopted is a vertical fire-tube one with an external steam and water drum to act as a reserve of water and steam during the rapid steaming which occurs during the blow. Efficiency is difficult to obtain with a boiler operating under such adverse conditions; but 50 p.ct. is normally attained, and with good manipulation a boiler utilizing the sensible heat of the water gas, and with an efficient recuperator, has reached 60 p.ct. by securing a better balance of the steaming periods.

Another use of waste-heat boilers, not very prominent in the gas industry, but nevertheless important to employers of batteries of coal or other solid fuel fired boilers, is the recovery of heat from the chimney gases from such boilers. A considerable amount of steam can be generated from the chimney gases from two or more Lancashire boilers. These gases usually leave the boilers at well over 1000° Fahr. and can be reduced to 600° Fahr. without spoiling the efficiency of the chimney, and to a much lower temperature by using a fan. Let us calculate the heat available by taking the gases down to 600° Fahr. using natural draught. The heat available is greatly in excess of that required for heating the feed water to the main boilers.

Specific heat of gases: At 600° Fahr., 0·240; at 1000° Fahr., 0·249—assuming approximate analysis as follows:

	By Volume.	By Weight.
CO_2	14 p.ct.	20 p.ct.
O_2	6 ,,	6 ,,
N_2	80 ,,	74 ,,

Taking two Lancashire boilers together burning about 12 tons of rough coke breeze per day, and allowing 20 p.ct. ash content (which should cover loss of fuel in clinkering) the following figures are obtained:

Carbon burnt = 9·6 tons = 21,504 lbs. per day,

or, 896 lbs. per hour.

This represents $896 \times \frac{44 \times 100}{12 \times 20} = 16{,}430$ lbs. of hot gases per hour.

Average specific heat from 600° Fahr. to 1000° Fahr. = 0·245.

Heat available = 400 × 16,430 × 0·245 = 1,610,140 B.Th.U. per hour.

= 1660 lbs. of steam from and at 212° Fahr. per hour.

Assuming 85 p.ct. boiler efficiency, this is equal to 1410 lbs. of steam per hour.

This is an appreciable amount of steam. Such boilers require little or no attention. Of course, the more the fired boilers are pressed, the more steam the waste-heat boiler will make. A "Kirke" vertical fire-tube boiler installed for waste-heat recovery from two Lancashire boilers on the author's works is making approximately 1000 lbs. of steam per hour.

Lastly, consider the use of waste-heat boilers on the exhaust of internal combustion engines. These are being successfully used by many firms. The exhaust contains about 40 p.ct. of the energy in the gas used; and the temperature of the gases is about 450° C. when the engine is functioning satisfactorily on full load. On engines over 80 B.H.P. the use of waste-heat boilers is a paying proposition. A special type of boiler has been brought forward for this purpose by Messrs. Spencer Bonecourt. It is of the fire-tube type, and is fitted with spiral cores which, by improving the rate of heat transmission, materially reduce the size of the boiler for a given engine. Corrosion in these boilers is avoided by rapid steaming, and by arranging the boiler so that the outlet temperature of the exhaust is well above that of the water in the boiler.

One of the stumbling blocks to the adoption of waste-heat boilers is the fact that steam at most gas-works is generated from coke breeze. When a waste-heat boiler is used, the breeze is left, and in many cases it is not easily sold. No solution of this problem is offered; but the author urges everyone to consider the use of breeze in other ways. Educate the public to use briquetted breeze; concentrate effort on the design of a producer to work with breeze; and fire retorts with the same fuel. Waste-heat boilers are not expensive in the long run. They generally pay for themselves in about three years. They should always be fitted with a reliable automatic feed-water regulator, and preferably a low and high water alarm, though the latter may become a nuisance, for, owing to the rapid evolution of steam in these boilers, it is apt to be brought into operation by surging. A reliable feed-regulating device (such as the "Thermofeed," made by Messrs. Ronald Trist, which is in use at the author's works) is really all that is necessary. Corrosion is not very noticeable in the boilers themselves, though feed-water heaters seem very prone to it. It appears to be due to the liberation of oxygen from the water on the surface of the tubes; and since there is no evolution of steam in the water heater, the oxygen is not swept away. Moreover, it is not easily removed prior to feeding the heater. In the boiler such corrosion is not so apparent, for the generation of steam sweeps the oxygen free from the tubes. A modern method used fairly successfully for avoiding such corrosion is to place an iron plate in the water heater, insulate it from the boiler, and make it the anode of a direct current supply of electricity. By suitable regulation of the current the oxygen is liberated on the iron plate instead of the tubes, and corrosion is avoided. Feed-water heaters are really not necessary, for the boiler uses up the waste heat efficiently.

Discussion.

The PRESIDENT (Mr. J. H. Clegg) congratulated the author on his paper. With regard to waste-heat boilers on the outlet of Lancashire boilers, the outlet temperature of their boilers was only 280° Fahr.; but they were using economizers. He also criticized the advisability of using a number of small-unit boilers on a series of settings, and thought that a large unit would be less trouble. What was the effect of the heat

of the boiler on the fan? He asked for further details of the electrical removal of oxygen.

Mr. BAMBER doubted Mr. Clegg's temperature of 280° Fahr., which was very low and not likely to give much chimney draught. As regards the effect of the heat from the boiler on the fan and motor, at Bolton the fan and motor were not fixed on the top of the boiler, but close to, and underneath, the waste-gas flue to the chimney. This flue had been lagged to prevent radiation of heat. As to the electrical removal of oxygen, the consumption of current was not very great.

Mr. A. COOK (Warrington) said they had a boiler similar to the one at Bolton, and the fan had been very successful. He asked the author if he had been troubled with the formation of iron sulphate in the tubes. In spite of precautions taken to limewash the tubes immediately after cleaning, they had experienced difficulties.

Mr. BAMBER, in reply, said they had trouble with the steam turbine fan, but little or no trouble with the electrically driven one. As regards corrosion in the tubes, they had experienced little trouble in ordinary working. After careful cleaning of the tubes, however, the boiler was out of action for some months, and prior to re-starting the tubes were examined, and were choked with iron sulphate. He thought the explanation lay in the absorption of sulphurous acid gases from the waste gases by the brickwork, and their slow liberation during the idle period, when they gradually attacked the tubes. It was advisable to examine the tubes from time to time during a lengthy stoppage.

Mr. H. E. STONE (Birkenhead) asked if the cleaning of waste-heat boilers, as compared with Lancashire boilers, was a serious question.

Mr. BAMBER replied that it was not.

Mr. W. H. BATTERSBY (Bury) said the type of boiler installed for waste-heat recovery was governed to a great extent by the carbonizing system adopted. In the Glover-West system one chimney per bed was the usual practice; and the small boiler was practically suited to these conditions. One great advantage of this arrangement was that flue travel between the setting and the boiler was obviated, and consequently heat losses were reduced to a minimum. In the one-boiler-per-bench system, heat losses due to long travel assumed a considerable figure. He had in his charge a "Galloway" waste-heat boiler working in conjunction with a bed of eight Glover-West vertical retorts. After eight months' continuous working, this boiler was examined; and the tubes and boiler were found to be in excellent condition. With regard to the recommendation of a good boiler composition for prevention of scale, in his opinion the only satisfactory method of dealing with this trouble was to instal a water-softening plant. The following figures were given as results obtained with a "Galloway" waste-heat boiler at Bury: Amount of water evaporated per hour, 523 lbs. Feed water temperature, 53° Fahr. Temperature under boiler, 835° C. Temperature above boiler, 469° C. Steam pressure, 90 lbs. = 331° Fahr. Superheater outlet, 648° Fahr.; inlet, 331° Fahr. Amount of superheat, 317° Fahr. Coal carbonized per setting, 23 tons. Coal carbonized per retort, 2·88 tons. Coke consumption in producers, 12·3 p.ct. (Dry, ash-free coke). Steam generated per lb. of carbon used in producers, 2·00 lbs. Heat efficiency of waste-heat boiler, 80 p.ct.

Mr. ASHTON (Messrs. Galloways), speaking of coke and solid fired boilers, said these claimed an efficiency of 55 p.ct., which could be increased to 65 p.ct. if economizers were used. As regards feed water, the use of water-tube boilers had caused more attention to be paid to the quality of the water. The water should be treated before it entered the boiler. Natural draught was the most dependable and the cheapest in the long run.

Mr. H. J. HAILSTONE (Rochdale) moved, and Mr. BRIGGS (Hyde) seconded, a vote of thanks to the author for his instructive paper. Mr. Bamber suitably replied.

THE WELSBACH MANTLE FACTORY.

Visit by the London and Southern District Junior Gas Association.

An afternoon is too short a space of time within which to inspect the whole of the processes carried on in a large and thoroughly up-to-date mantle factory; but so far as may be humanly possible, the feat was accomplished last Wednesday at the Broomhill Road, Wandsworth, works of the Welsbach Light Company, Ltd., by about seventy members of the London and Southern District Junior Gas Association. On arrival, the visitors—who included Mr. Walter Grogono (the President of the Association) and Mr. Leonard Lacey (the Hon. Secretary)—were met by Mr. B. Bark (the Works Manager), who was supported by members of the staff; and, in small parties, under experienced and tireless guides, the tour proved to be both profitable and enjoyable.

As has been said, the time limit precluded a complete inspection of everything there was to be seen; but nothing else stood in the way of members obtaining full knowledge of the complicated processes of mantle making as practised to-day. Mr. Bark gave his staff instructions that nothing was to be hidden, and that any questions asked should, as far as they were capable of doing it, be answered; and he himself afterwards admitted that some of them had been of a very shrewd character. Full understanding of the working of the wonderful machines was difficult; but all could, and did, admire the smoothness and efficiency of their operation. Some idea of the number and extent of the processes to be examined will be gathered, when it is mentioned that the number of mantles made annually by the Welsbach Company runs into many millions, and includes over 1000 different sizes, shapes, weights, or kinds. Their smallest upright mantle has a length of $1\frac{5}{8}$ in., and a width at the bottom of about $\frac{3}{8}$ in.; and the largest—which is claimed to be the biggest mantle in the world—has a length of 11 in., and a maximum width of over $5\frac{3}{4}$ in. The Company's smallest inverted mantle is about $\frac{7}{16}$ in. long, and some $\frac{5}{16}$ in. in diameter; while the largest has a length of $3\frac{3}{8}$ in., and a diameter of $1\frac{7}{8}$ in. Each box in which a mantle is packed is carefully marked, so that its history can be traced from the first operation until it leaves the factory. Incidentally it may be remarked that Welsbach are the only mantles used in British lighthouses; and the mention of the word "British," leads one to add that no worker employed in the factory is other than British.

The Chairman of the Company (Mr. J. R. Yates) afterwards expressed the hope that the visitors had seen good work well executed; and they certainly had done so. A beginning was made with the knitting and weaving of the yarns into stockings of various tensions and types of stitch. The latter has an important bearing upon the strength of the finished mantle. Generally speaking, and within certain limits, a complex stitch adds to the strength of the mantle, and also to its cost. Some yarn is woven instead of knitted, giving a fabric which produces a mantle of great strength and durability. A short time was spent in the fabric washing and drying departments, and then the impregnating stage was reached; and after that the cutting and topping, the fixing, the branding, the sewing, the modelling, the burning-off, shaping, and seasoning, and the collodionizing were witnessed. At every step there was something of interest to see—so much so, in fact, that not the lightest task of the guides was to keep their respective parties together, by whipping-in stragglers who displayed a tendency to linger too long at one particular spot. And this desire to lag was not invariably in connection with the machinery. The marvellous dexterity of the workers—all women and girls, and exceedingly well trained—was also a wonder to men who fumble over the daily task of lacing-up a pair of boots.

When the mantle is made, the work at the factory is by no means complete; for the packing itself is an art, and is preceded by another important operation. Every single mantle made by the Welsbach Company is thoroughly examined by experts before it is packed, and all but the perfect are rejected. In addition to this, mantles of every type being made, and representative of batches going through the works, are tested several times a day, both before and after collodionizing. The tests used in each case are far more severe than any to which a mantle would be subjected in ordinary use. Of the factory itself, it may be said that it is a model one in every respect—no pains having been spared to promote the comfort and welfare of the workers.

At the conclusion of the inspection, conveyances were in waiting to take the members to the Connaught Rooms, to meet the Chairman of the Company, with whom they dined, and who manifested his interest in the Association by remaining with them throughout a pleasant evening.

Mr. J. R. YATES said that, as the Chairman of the Welsbach Company, it was his pleasure to extend to the Association a very hearty welcome. He had received a telegram from the General Manager (Mr. Harold Talbot) regretting his inability to be with them. He (Mr. Yates) understood it was the first time the Association had visited the Company's works; but he hoped that what they had seen had so much interested them that some day they would come again. The great advantage of occupying a junior position was that those who did so had a splendid opportunity of looking forward; and this he thought was a better thing than looking backward. He hoped that in due course all those present would occupy the higher positions to which they were doubtless aspiring.

The PRESIDENT remarked that they had had a most interesting afternoon, and had examined machines such as they had never seen before. There was no doubt that the Welsbach Company made mantles in a most efficient manner.

Mr. H. W. KERRIDGE proposed a hearty vote of thanks to Mr. Yates, Mr. Bark, the members of the staff who had assisted, and the Welsbach Company, for all they had done to make the visit a success. He expressed the opinion that, if the matter were approached in a proper spirit, there was no reason to fear for the future of the lighting load. They would keep it in the face of the keenest competition. With mantles such as the Welsbach at hand, there was every incentive to them to go ahead.

Mr. E. L. OUGHTON seconded, and remarked upon the admirable general lay-out of the works, and the absence of reticence on the part of the staff during the visit.

Mr. S. B. CHANDLER, in supporting the vote, emphasized the "all-British" character of the Welsbach Company. All the employees, he pointed out, were British, and so was all the money that was in the Company. It was imperative that they should all as far as possible support home industries, and thereby reduce the great amount of unemployment. The imports of mantles from foreign countries were colossal; and this was very regrettable. Mr. Kerridge had made a "fighting speech," and this was the spirit prevailing throughout the Association. They stood for a great industry, and they did not for one moment consider that gas for lighting was a "dead-letter."

Mr. B. BARK, replying on behalf of the staff to the vote (which had been heartily accorded), said it had been an unusual experience to have such piercing questions asked as those which had been put by the visitors that afternoon; but he had told his staff that there was nothing to hide, and that all queries should be answered. The inspection had been a great pleasure to every member of the staff, because they had felt they were showing round people who took a real interest in what they saw.

Mr. YATES also acknowledged the compliment, and remarked that he would suggest to them as a slogan: "Keep the gas-fires burning." That the Welsbach Company was all British was perfectly true. No worker in the factory was other than British.

ACTION OF NITRIC ACID ON COAL.

An Abstract of the Results of an Investigation by A. V. Hendrickson.

Last June we gave an abstract of research work undertaken by Mr. A. V. Hendrickson on the action of nitric acid on coal [*vide* "JOURNAL" for June 6, p. 592]. Since that date further experimental data have been obtained; and the inferences drawn from this additional investigation have been published in the current issue of "Fuel in Science and Practice."

As before, the tests have been confined to gas coals—this time being applied to a series of coals from Somerset. The earlier experiments showed some vague connection between the volatile matter content, the increase of temperature on treatment of the coal with nitric acid, and the increase in weight on evaporation with nitric acid. The results given were not calculated to a dry ash-free basis; and on recalculation to this standard the relationships appear still more vague. Comparing two Somerset coals giving approximately the same percentage of volatile matter, there is a difference of 5° C. in the temperature obtained at the end of five minutes on stirring with nitric acid, and a difference of 8·5 p.ct. in weight on evaporation. The author has not yet met with an instance where the change in weight was a negative quantity; neither can Boudouard's conclusion, that the evolution of heat is greater the greater the volatile matter content of the coal, be confirmed.

The increase in temperature when nitric acid is added to coal is probably due to the joint action of nitration and oxidation, which under the conditions of the experiment reaches its maximum in five minutes. At the higher temperature of the evaporation with nitric acid, these reactions are modified, and their relative importance is altered. Further, the gaseous products from the two treatments are not the same with the same coal. The gaseous products also differ with the different coals, and the colours of the products vary. Therefore, states the author, the results obtained by the action of nitric acid on coal must be governed by the constitution of the coals, not only as regards the ulmin content of the latter, but also as regards the relative proportions of the banded constituents present. Experiments were carried out on these banded constituents; the mean figures for each being given in the following table.

Mean Figures (Dry, Ash-Free).

—	Fusain.	Durain.	Clarain.	Vitrain.
Volatile matter, p.ct.	19·8	34·8	35·5	33·8
Fixed carbon, p.ct.	80·2	65·2	64·5	66·2
B.Th.U. per lb.	14,793	14,873	14,519	14,490
Addition of nitric acid—				
Start, °C.	15·6	15·6	15·6	15·6
1st min.	22·2	29·9	30·9	31·7
2nd ,,	22·8	31·6	33·9	34·7
3rd ,,	23·2	32·5	35·3	36·0
4th ,,	23·4	33·0	36·1	36·8
5th ,,	23·5	33·3	36·6	37·3
Total increase in temperature	7·7	17·7	21·0	21·7
Evaporation with nitric acid; increase in weight, p.ct.	14·2	28·4	28·1	28·6
Fixed carbon	4·0	1·9	1·8	2·0
Volatile matter				

It will be seen that the values for the volatile matter content and for the rise in temperature on the addition of nitric acid, and the increase in weight on evaporation show no correlation with each other or with the corresponding figures for the other banded constituents. While fusain, durain, clarain, and vitrain from the same coal may be distinct and show distinct variation in chemical and physical properties, this generalization does not indicate that similar banded constituents from other sources will exhibit the same characteristics. From a practical and analytical point of view, this is a disappointing fact, for it was hoped that the action of nitric acid would lead to developments of a quick method for the differentiation of coals used in manufacturing operations.

WALES AND MONMOUTHSHIRE JUNIOR GAS ASSOCIATION.

Some Aspects of Gas Lighting.

A General Meeting of the Association was held at Cardiff on Saturday, the 1st inst., when Mr. T. A. CANNING (the President) was in the chair.

Mr. J. W. LOFTS (of Messrs. William Sugg & Co., London), who received a hearty reception, delivered a lecture on "Some Aspects of Gas Lighting," which he illustrated with lantern slides. He emphasized the necessity of scientific construction of gas-burners, pointing out the absolute need of calibration of parts, in order that the mixture should be injected to the nozzle under the best conditions for combustion. From this aspect, he explained the construction of the different parts of burners, and afterwards showed the effect obtained in flame formation with a correctly designed inverted burner. He brought to notice, by means of polar-curve diagrams, the illuminating power of different types of burners, and explained the design and construction of the superheater, as well as its theoretical principles.

The lecturer dealt with street lighting by means of conversion sets for existing lanterns, and paid special regard to outside shop lighting with automatic control. He drew attention to the desirability of giving the consumer the same advantage of being able to switch on his lights as with electricity. Several devices were mentioned, which amply fulfilled this requirement, for shops, public halls, and places of worship.

Many illustrations were shown of successful installations of gas lighting which have recently been fitted in railway stations and other public places. It was also mentioned that for council school lighting special types have been designed, in order to overcome objections raised, with the result that many schools in the country depended upon gas lighting for illumination and the authorities expressed every satisfaction with the results.

Discussion.

The PRESIDENT, proposing a hearty vote of thanks to Mr. Lofts for his lecture, remarked that it had been very intellectual and instructive. Mr. Lofts had come from London to give the Association the benefit of his wide experience and deep knowledge. He had told them a great deal that they did not know before, and they had learned more from him in one afternoon than they could have gleaned from many months' study of various text-books on the subject. Mr. Lofts' remarks had assured them that gas lighting was not doomed, and that it had a very great future before it. He (the President) condemned the cheap burner, which was extravagant, non-lasting, and inefficient. This also applied to cheap mantles, which were poor in quality, used more gas, gave a bad light, and were absolutely unreliable. For these faults, gas companies were often unjustly blamed, instead of the makers of the shoddy apparatus.

Mr. T. E. FRANKLIN (Barry), who was welcomed to the meeting by the President, seconded the vote, and said it had been a great pleasure to hear Mr. Lofts, who had rendered considerable service to the industry as far as lighting was concerned. He agreed with the lecturer in his statements that the industry did not thoroughly appreciate the points of correct illumination.

Mr. A. H. SHEPHERD (Swansea) spoke of the necessity of supplying mantles suitable for the burners they sold. Much harm was done by cheap mantles which did not fit the flame, and consequently were the cause of complaints. He found that it was advisable to secure the interest of the retail traders in this matter—particularly the small dealer, who would otherwise be tempted to sell inferior goods, as he was not interested in efficiency. In Swansea, they sold mantles to retailers.

Mr. B. J. BELL (Cardiff) stated that the lighting of several schools had been altered, with gratifying results. It was found that the illumination had been considerably improved, and the consumption of gas very much reduced. Adequate illumination was a complicated problem, which in many cases had not received the attention to which it was entitled. Often lights were installed without taking into consideration whether the point was in a correct position. There was no doubt that for church lighting, which had been mentioned by Mr. Lofts, gas was very efficient. The question of distance control was one which should receive careful attention, as this convenience was vital when deciding upon installations in public places.

Mr. F. MARSH (Lighting Superintendent, Cardiff Corporation) said that, as far as street lighting was concerned, he was satisfied that the twin burner was very efficient in use.

Mr. LOFTS, acknowledging the vote, declared that it had given him great pleasure to address the meeting, and he intended to have the information printed for distribution among the members.

From Natural to Manufactured Gas.

Last winter, because of depletion in the natural gas supply at Elmira (N.Y.), manufactured gas was substituted; and this winter, for the same reason, manufactured gas will be similarly substituted at Ashtabula, Conneaut, Geneva, and Jefferson, Ohio. At Louisville (Ky.), after many years of satisfactory service, the natural gas supply is no longer equal to the city's requirements; and a manufactured gas plant of large capacity is being constructed to meet the demand of the coming winter and thereafter. Again, the supply of gas passing from West Virginia and Ohio into Indiana has been depleted to such an extent that on Aug. 1 of this year the discontinuance of natural gas and the substitution of manufactured gas took place in Indiana at Muncie, Anderson, Alexandria, Fairmount, Hartford City, and Marion. Richmond and New Castle (Ind.) are to discontinue next year, and construction work on manufactured gas plants at these places is already well under way. The Indiana towns of Winchester, Union City, and Portland have also successfully substituted manufactured gas for the natural product. In placing these facts before the Ohio Gas and Oil Men's Association convention, Prof. D. J. Demorest, of the Department of Mines and Metallurgy at the Ohio State University, pointed to the advantage, where the supply is falling short, of conserving the remaining natural gas supply, by using it only as an enriching agent of raw material in the manufactured gas industry. This gives no great difficulty, and has been done in a number of places. A gas appliance that has been designed to use natural gas will not necessarily be suitable, as it stands, for manufactured or mixed gas; but it has been found that the changes and adjustments necessary are easily made and inexpensive. It is quite possible that it will be necessary to instal in the larger towns a high-pressure distribution system with district pressure regulators, each regulator serving, perhaps, one square mile. There is no region in the world more advantageously situated for producing manufactured gas, so far as raw materials are concerned, than Ohio. In West Virginia, Kentucky, and Western Pennsylvania, is the finest gas coal in the world; while Ohio has an enormous amount of coal which, though not as high-grade as those just mentioned, with natural gas as an enriching agent it may be more profitable to use than the more expensive coals.

AMERICAN GAS ASSOCIATION.

Some Notes from the Papers and Reports.

(*Continued from p.* 525.)

Machine Billing and Book-Keeping.

The Customers' Accounting Committee submitted reports of their various sub-committees, and a statement by Mr. W. H. Barton, of Portland (Ore.), on "Machine Billing and Book-Keeping as in force with the Portland Gas and Coke Company." The Company have 74,000 customers' gas accounts. The debit posting and cash posting on such accounts, as well as the rendering of the bills, is handled on the machines. Each month there are about 3000 final debit postings, consisting of locked meter orders for premises being vacated, which are not handled on the machine, but by pen-and-ink, because they involve changes of the headings of the sheets. Both entries are therefore made at the same time. The bills for such entries are, however, made on the machines. In all, ten machines are used—three for debit posting, three for billing, three for credit posting, and one for ledger control sheets. The 188 ledgers are filed in eleven cases, under which are placed the ledger charts; the accounts being arranged in street order. The sheets are intended to cover the different customers' premises, and therefore remain in the ledgers permanently; any changes of tenants or meters being simply noted on the headings of the sheets. Meter reading books are not used, as the Company consider their maintenance a useless expense. All changes of names, meter numbers, &c., are, of course, made on the addressograph plates; and therefore, under the continuous reading system, the Company print on the addressograph a given number of bills each day, and at the same time a "tape" (double width adding machine paper) is printed for each meter reading route. The reading media for each man are therefore automatically up-to-date at all times. The meter readers, having no previous readings, cannot fake the current month's readings. These tapes form the items of original entry in posting debits.

In order to enlist the interest of the employees in developing a reasonable speed in the operation of the machines, a bulletin is posted daily showing the results for each individual, as well as the total average results for the three operations—debit posting, credit posting, and billing. Owing to various changing factors, it is difficult to compare the cost of doing the work with the machines with that of the old pen-and-ink method; but the Company are convinced that a substantial saving is being made—in any event more than sufficient to cover the maintenance, interest, and depreciation of the investment. The machine is obviously more rapid than the old hand method, chiefly because of the automatic features—such as dating, listing, additions, subtractions, cipher printing, &c. Greater accuracy is obtained because of these features, and the records, of course, are much more legible and neat in appearance. The Company, therefore, feel that the adoption of the book-keeping and billing machines has been a move in the right direction.

Standard Gas-Range Specifications.

The Committee on Standardization of Gas Appliance Specifications submitted a revised (1923) standard gas-range specification, and standard method of test. They also suggested a design of adjustable gas-range cocks, on which the best test results were obtained. Either of two designs illustrated in the report may be used for officially marking appliances which are built in strict accordance with American Gas Association specifications. One design is particularly adaptable where the application of the marking is directly to the apparatus itself. The other can be used in the same way, but it is specially suitable for use as a metal tag to be fastened to the appliance. Size and colour are optional with the manufacturer.

Domestic Use of Coke.

The Coke Committee, feeling that their principal effort should be to impress gas companies with the intrinsic value of their coke as a domestic fuel, and the more important considerations as to sizing, handling, &c., in order to make the coke adaptable to the domestic market, prepared a report on these lines. Stress is laid on the fact that satisfactory operation with coke depends primarily upon correct sizing.

In order that new customers may understand what instructions should be given as to the proper use of coke, the salesman should explain that, pound for pound, coke has as much heat as anthracite coal, and about half the volume of ashes, and also that when a ton of coke is delivered, it requires about 60 c.ft. of bin space, instead of approximately 40 c.ft. for coal. This mental picture of the relative volumes of the two fuels will be of great assistance in convincing the purchaser that it is necessary to use six shovels of coke, instead of four shovels of coal in order to get the same amount of heat into the apparatus. About 90 p.ct. of the householders using anthracite believe, say the Committee, that it is more economical to have a shallow fire under strong draught than a deep fire under very little draught. If this belief can be corrected in connection with the use of coke, and the customer convinced that his furnace or heater should be filled full, and the fuel utilized at a slow rate of combustion, the battle is more than half won. The relative volume of ashes should be dwelt upon to some extent also. If the coke contains half the volume of ash as compared with the anthracite coal, the heater will require only half the amount of shaking.

Accident Prevention.

In their report, the Accident Prevention Committee recognized with appreciation the growing interest throughout the industry in this subject. The Association's Commission on Resuscitation have compiled a booklet on "First Aid and Resuscitation in Gas Asphyxiation," and this formed an appendix to the report. In this connection, the Committee are of opinion that it is impossible to over-emphasize the importance of systematic training of all employees in the prone pressure method of resuscitation, and the providing of thoroughly trained operators of the oxygen-carbon-dioxide inhaling plan. The final report of the Resuscitation Commission, also given as an appendix, emphatically approved the prone pressure method, and voiced the opinion that this, together with the development of the carbon-dioxide system, is of signal importance, not only to the gas industry, but to the public generally. Mr. Walter A. Addicks (Vice-President of the Consolidated Gas Company of New York City) has, upon the suggestion of the Committee, donated a medal, to be known as "The American Gas Association's Meritorious Service Medal," to be awarded under reasonable conditions for the saving of life by employees of member companies of the Association.

The Committee have had in mind that the industry has received from time to time some unfavourable notoriety with reference to asphyxiation by gas in connection with its use. Through a Special Sub-Committee, they have collected certain statistics (also submitted as an appendix) which prove almost conclusively that much of the notoriety mentioned is unfair, and that the detractive inferences drawn against the use of gas are unfounded. While it is true that there are many fatal asphyxiations, nearly all of them are suicides. At the same time, it does seem to them that the comparatively few real accidents justify a proper investigation of the subject, particularly with respect to the use of improperly designed or installed appliances. Such an investigation properly belongs to the gas industry. It is seen from the table alluded to that out of a total of 1100 deaths from manufactured-gas poisoning during the year 1922, 791, or 71·9 p.ct., were suicides, and 309, or 28·1 p.ct., were returned as accidents. Of the latter, no details were given in 258 cases; and it is not certain that all of these deaths were accidental.

New Method of Treating Carbon Monoxide Asphyxia.

Reference has been made above to the final report of the Commission on Resuscitation from Carbon Monoxide Asphyxia. This detailed an effort, which the Commission have every reason to feel has been successful, to provide a new and more efficient means for resuscitation. Three well-known facts form the basis for this new method of procedure, which is entirely due to the work of Dr. Yandell Henderson and Dr. H. W. Haggard: (1) Carbon monoxide combines with hæmoglobin, displacing oxygen; and the harm done in gas poisoning arises from the oxygen deprivation which results. (2) The most effective physiological means for breaking down the combination of carbon monoxide and hæmoglobin is offered by the mass action of oxygen—that is, in the presence of large amounts of oxygen, carbon monoxide is forced out of the hæmoglobin molecule more rapidly than in lower oxygen concentrations. (3) The most effective physiological stimulus for respiration is carbon dioxide.

Because of these three facts, and because of the observation that in gassed persons the carbon dioxide content of the body is low, these two doctors have advocated the use in cases of gassing of inhalations of 5 p.ct. of carbon dioxide in oxygen. This mixture causes a great increase in respiration; and this respiratory increase fills the alveoli with a very high percentage of oxygen, thus displacing carbon monoxide from the hæmoglobin molecule with the greatest possible expedition. It has further been found that the breathing of this carbon-dioxide-oxygen mixture is attended by no danger to the subject. The treatment was practically tested; and subsequent experience with the method, both in reviving gassed persons and in hastening recovery from etherization, has served to increase the confidence of the Commission in the wisdom and safety of a plan which not only meets an immediate emergency, but also, by shortening the period of lack of oxygen, reduces the frequency of unfortunate sequels after gas poisoning.

In order to provide this treatment, apparatus is necessary; and therefore the general objection of delay, which is inherent in all methods of resuscitation demanding apparatus, applies in this case. Since, however, the inhalation provides a specific remedy for use in gassed persons, the handicap of delay must be accepted, and overcome as far as possible by proper placing of apparatus. It is obviously of extreme importance that the inhalations be given promptly. Unconsciousness may persist long after carbon monoxide has left the blood. This prolonged unconsciousness is an expression of the harm done by a prolonged period of lack of oxygen—the very situation which the inhalation is pre-eminently adapted to prevent.

Benefits of Newspaper Advertising.

It appeared from an address delivered by Mr. Arthur W. Hawks, Jun. (Advertising Manager of the Consolidated Gas, Electric Light, and Power Company of Baltimore), on "What Newspaper Advertising has done for our Company," that the phrase, "Is your service good? If not, please let us know," has been printed more than 31 million times in the Baltimore news-

papers during the last eighteen months. The most profitable form of advertising, he said, is to be found in straightforward use of newspaper space. There is no royal road to success in public utility advertising; but the advertising columns of a gas undertaking's home-town newspaper will be found the direct avenue to the minds of the consumers. If this space is used to tell them the truth about the company—to tell them in a way that will make them understand what the undertaking is doing for them day by day—two things will be accomplished. The service will be made more valuable to the customer, and the customer more valuable to the gas undertaking. Good public service demands efficient production and efficient use. The co-operation of the customers must be secured; and the simplest way to obtain it is to deserve it, and to ask for it through newspaper advertising. Nobody will do it for you. Publicity is not automatic. The newspaper itself must advertise, if it wishes to prosper; and the most successful newspapers are efficient advertisers.

(*To be continued.*)

Fuel Oil Characteristics.

Mr. A. P. Bjerregaard, of Bartlesville (Okla.), Chief Chemist of the Empire Refineries, in an address to the International Petroleum Congress, showed that oils which contain more hydrogen relatively to the carbon will develop during combustion more heat than those which contain more carbon relatively to the hydrogen. This, however, applies only when considering the unit weights. Based on the unit volumes, the relationship is reversed, because those oils which contain more carbon, being heavier, weigh more pounds per gallon than the lighter oils which contain more hydrogen. Weight for weight, fuel oil will give out more heat on combustion than coal, even when the coal is free from ash. This is largely due to the fact that fuel oil contains much hydrogen, while coal does not. A pound of fuel oil will average between 18,600 and 20,000 B.Th.U., while a pound of very good coal will give only about 12,000 B.Th.U. Fuel oil has an advantage over coal in that the radiant heat from its combustion is an important factor in its use. It is not necessary to impinge the flame directly on the substance to be heated. Particular attention was drawn by the author to the use of steam for atomizing fuel oil. When, he said, we remember the very high specific heat of steam, and when we take into consideration the fact that the steam is introduced into the burner, and thus into the fire, at a temperature of about 212° Fahr., whereas it is carried away with the flue gases at a very much higher temperature, it will be realized that an enormous amount of heat generated by the combustion of the fuel oil is carried away uselessly in the latent heat of the steam which escapes from the chimney. As a matter of practical experience, it has been found that sulphur in fuel oil has no corrosive effect, unless the products of combustion are cooled below the condensing point of the moisture contained therein.

Light Oil Composition and Meter Deposits.

A United States Bureau of Mines report, by Messrs. Brown Pohlman, and Berger, of investigations into the matter of gummy deposits from carburetted water gas, is noticed in the Nov. 24 issue of the "Gas Age-Record." The inquiry has been undertaken in co-operation with the American Gas Association, and the present report gives the results obtained in a study of the variation in composition of the light oil from three typical gas oils when cracked in an atmosphere of blue gas under identical conditions. The basic plan of the investigation was to maintain entirely constant the apparatus, the cracking procedure, the light oil recovery, and the methods of examination of this light oil. The only two variables were the oils tested and the cracking temperatures, which were changed singly. The three oils were cracked at two temperatures each—namely, 1350° and 1400° Fahr; in addition, one oil was cracked at 1300° and at 1450° Fahr. In a survey of plants made by one of the writers in 1922, seven were found in which there was distinct trouble from gummy deposits, but in the other eleven no such trouble was being experienced. The average cracking temperature in the first set was 1329° Fahr., while in the second set the average was 1374°. At the same time, it is pointed out that in plant operation the temperature at which the oil is cracked cannot be considered the sole controlling factor. High rates of oil input, and wide spacing of the chequer-brick in carburettors, are equivalent in result to a reduction of the cracking temperature, which must eventuate in a serious increase in the gum-forming constituents of the gas. In the plant survey referred to, it was found that high rates of oil input paralleled quite closely the occurrence of gummy meter conditions. Briefly, the conclusions arrived at as the result of the investigation are: Gum troubles in distributing systems are basically dependent upon the composition of the light oil of the gas, and are especially due to the heavier, unsaturated hydrocarbons of the aromatic series. Gas oils of different properties cracked under identical conditions give rise to different amounts of gum-forming constituents in the resulting gas. The temperature at which cracking is done has a marked influence on the amount of gum-forming constituents in the gas. These decrease sharply with increase of temperature within cracking limits. The time and contact factors in cracking are tangible, and somewhat elastic as control measures. They are interdependent, and both act reciprocally to changes of temperature.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

Waste Heat in Carbonizing Plant.

SIR,—Mr. Thorman is unfortunately still absent through illness, and is therefore unable to reply to the criticism which has appeared in the "JOURNAL" of the test of waste-heat boilers, particulars of which were given in his paper to the Southern Association.

The writer of the leading article in the "JOURNAL" of the 28th ult. points to certain inconsistencies in the figures, and then assumes that the measurement of the coke or of the water was inaccurate, as the stated evaporation was impossible of attainment, when calculated from the thermal content of the waste gases obtained from the figures given of their analysis and temperature. Messrs. Woodall-Duckham do the *reductio ad absurdum* argument with the latter figures.

The test was made by the staff at Stratford, with the apparatus in daily use, and under the ordinary working conditions, to ascertain the steam raised by the boilers in relation to the fuel used in the producers. At the beginning of the test, the producers were all filled, and at the end of the test they were left as nearly as possible in the same condition. The quantity of fuel was all measured and check-weighed. The water to the boiler was measured by a tipping type of meter. No serious inaccuracy was possible. The water meter has since been checked, and in a subsequent test the whole of the fuel put into the producers carefully weighed; and the figures of the first test are substantially confirmed.

Now let us examine the figures relating to the CO_2 content and temperature of the waste gases, which critics seem anxious to assume are correct, so as to throw doubt on the more important figures. As a basis of calculation these figures must represent accurately the average CO_2 content, and the average temperature of the waste gases from ten chimneys, together with the same figures for the gases passing along a flue 4 ft. 10 in. in diameter, the temperature of which is about 800° C. Such figures can, with difficulty, be obtained within 5 p.ct., if sufficient apparatus and staff are provided. Mr. Thorman, however, had neither at his disposal, and only took tests on these points for his information. The number of tests taken was not large, and they could not have been representative of the average conditions existing throughout 24 hours.

Mr. Thorman will, I am very sure, regret making a misstatement with regard to the installation of waste-heat boilers in a Woodall-Duckham installation. In the third paragraph of that firm's letter, they state a truism which is not *à propos*. The working of the producers was normal, and such as has been found advisable for the economical carbonization of coal under the conditions of throughput and steaming desired.

The quantity of steam produced has been consistent from day to day, and has been more than sufficient to supply the whole of the steam required for the station, though the total coal-gas plant at work is nearly double the capacity of that from which the waste heat is received.

T. HARDIE, Chief Engineer.

Gas Light and Coke Company,
Horseferry Road, Westminster, S.W., Dec. 10, 1923.

SIR,—I read with much interest the account given in your issue of Nov. 28 of the paper on "Waste Heat," &c., presented by Mr. J. S. Thorman to the Southern Association of Gas Engineers and Managers. In view, however, of the high figure given by Mr. Thorman for the amount of steam actually raised in the waste-heat boilers attached to the continuous vertical retort installation (the amount raised was equivalent to 5·91 lbs. of steam from and at 212° Fahr. per pound of dry fuel used in the producers), the data given in the paper have been examined.

The method of calculation and the results obtained therefrom are as follows:

Results per Pound of Dry Fuel to Producers.

Wt. of carbon in fuel (assumed)	0·85 lb.
Wt. ,, gasified in producers (assumed)	0·80 ,,
CO_2 in waste gas at inlet boiler	13·5 p.ct.
Wt. of waste gas at inlet boiler	15·07 lbs.
Temp. ,, ,, ,,	689° C.
Heat carried by waste gas entering boiler	4550 B.Th.U.
Water vapour in waste gas (assumed)	0·75 lb.
Heat carried by water vapour at 689° C.	1300 B.Th.U.
Total heat entering boiler	5850 ,,
Temp. of gases leaving boiler	225° C.
Heat carried by gases (including water vapour)	2285 B.Th.U.
Heat available for raising steam	3565 ,,
Maximum amount of steam which could be raised from and at 212° Fahr.	3·67 lbs.

According to these figures, the maximum amount of steam which could have been raised during the test is equivalent to only 3·67 lbs. per pound of fuel, whereas the amount given in the paper is equivalent to 5·91 lbs. from and at 212° Fahr. At the same time, it should be pointed out that the method of calculation is of necessity based on the assumption that there is no leakage of products of distillation from the retorts to the combustion chambers and waste-gas flues, or of producer gas and waste gas into the retorts. This assumption is not strictly correct. If there is a leakage from the retorts to the combustion chambers and waste-gas flues, then the amount of steam raised might appreciably exceed the quantity possible as calculated without any allowance being made for such leakage; although it would not be anticipated that in ordinary practice the discrepancy would be so great as the difference between 5·91 lbs. and 3·67 lbs.

The figures given by Mr. Thorman may not enable the construction of thermal balances—indeed, to obtain the necessary data with sufficient accuracy is a task beset with great difficulties—but the paper is valuable in that it should focus greater attention on the problem of the recovery of waste heat.

A. PARKER.

Frederick Road, Wylde Green, Birmingham,
Dec. 6, 1923.

Gas Undertakings and Electricity Supply.

SIR,—In your "Editorial Notes" in the issue of the "JOURNAL" for Dec. 5, attention is drawn to the Bill now being drafted by Messrs. R. W. Cooper and Sons to overcome the difficulties of gas undertakings in obtaining powers for a combined electricity and gas supply. Gas undertakings in medium-sized towns hold the key to the successful management of the electricity supply, by reason of their existing organization, production of fuel, and other advantages, but are hampered by difficulties in obtaining the necessary powers.

As stated in your editorial, it would have been to the advantage of the country and community if every gas-works had been made the centre for the supply of both gas and electricity; and if the Bill now being drafted will assist in retrieving a lost opportunity, I would suggest it is worthy of both the financial and sympathetic support of the gas industry.

W. CHANEY.

5, *Victoria Street, Westminster, S.W.*,
Dec. 9, 1923.

"Electric House" Pamphlet.

SIR,—I make no apology for being a reader of the "JOURNAL," because, like you, I have long recognized the advisability of keeping in touch with the operations of "The Shop over the Way." May I say that I have read with not a little interest the paper (and subsequent discussion) by Mr. Jamieson, of Edinburgh, in which reference was made to a pamphlet dealing with the comparative running costs of test houses in Glasgow equipped with gas and electricity.

It was, I note, suggested that the pamphlet bristled with misstatements; and, while it is easy in a friendly audience to make such a statement, I venture the opinion that the claim cannot be supported by evidence drawn from the pamphlet. Though my paper was in the first instance addressed to a body consisting mainly of those engaged in the electrical industry, I was careful, then, as always, to refrain from using my platform as a "coward's castle," where one might decry unfairly the absent opposition; and I claim that my talk (since reprinted) did not contain a single statement which cannot be proved up to the hilt.

One speaker (Mr. Keillor, Greenock) is reported to have expressed doubt as to the genuineness of the figures quoted, but I have no wish to be drawn into argument with an opponent who stoops to that kind of innuendo. How can the figures quoted be challenged? Those referring to the gas houses were taken from the "Glasgow Herald," and could only have been furnished by the tenants of the houses, who were both in the gas industry, and were therefore not likely to inflate them.

That they may be considered normal is, I think, proved by Mr. M'Lusky, of Halifax, who in a recent issue of the "JOURNAL" cited a case of a house rented at £13 (presumably a residence of very modest proportions), having an annual consumption of 105,000 c.ft. of gas, which at the Glasgow rate of 3s. 7d. would yield a bill of £18 16s., compared with £18 8s. 7d. for electricity and coal in a much larger house, containing five rooms, kitchenette, and bathroom, and of a rental of £40, quoted in my pamphlet. With regard to the electricity figures, I would repeat that these were actual costs. What could we hope to gain in the long run by publishing artificially low figures?

The results in these houses, or in any others in the Glasgow area, do not bear out the contention of gas advocates (reiterated by Mr. Jamieson) that "for the joint service of lighting, cooking, and heating, gas is at least three times cheaper than electricity." If that statement were even approximately true, the gas industry need not alarm itself on the score of our activities. I realize to the full that if electric service is even double the cost of gas—nay, 50 or 25 p.ct. higher—it cannot make headway. But this question in the last resort will not be settled by any electrical society or by a gas salesmanship conference.

The public, with its present knowledge of gas and its growing knowledge of electric equipment and comparative costs, will be the arbiter; and the electrical industry is content to await and accept without question this judgment.

R. HARDIE.

Glasgow Corporation Electricity Showroom,
No. 251, *Sauchiehall Street, Glasgow, Dec.* 4, 1923.

New Scale at Todmorden.—The Todmorden Gas Committee have adopted a new scale of charges, ranging from 7d. per therm for large consumers for power purposes, to 1s. 2d. per therm for ordinary.

Chertsey Gas Consumers' Company.—At the annual meeting held recently, the Directors submitted the statement of accounts for the year ended Sept. 30. The balance standing to the profit and loss account, including that brought from the previous year, is £317. The Chairman (Mr. W. Moir) moved the adoption of the report, and said there had been a marked improvement in the general trade of the Company during the year. The price of gas had been reduced; and this, by reason of the sliding-scale, had enabled them to raise the dividend to 10 p.ct. on the original shares, and to pay 7 p.ct. on the "D," "E," "F," and "G" shares. The 5 p.ct. and "I," and also the new "J" shares, remained unaltered.

Elland and Electricity.—A week or two ago the electricity publicity people of Yorkshire were delighted to read in all the papers that the Elland Electricity Committee recommended the conversion of the whole of the town's street lighting to electricity, at an estimated cost of only £7500, and that the scheme was going to find work for local unemployed. In this scheme Elland was to give a lead to the local authorities of West Yorkshire. And it was practically a certainty, because the Elland Electricity Committee comprises the whole of the Council. But things have not worked out quite so well. The Council, though on another occasion it is the Electricity Committee, last week rejected the scheme, and referred it back to the Committee—which is the whole Council. The Chairman of the Lighting Committee was one of the strongest opponents, contending that the cost was more likely to be £10,000 than £7500. The Manager of the local gas undertaking (Mr. J. Bridge) had, in the meantime, also expressed strong criticism of the scheme, contending that the estimate was very wide of the mark.

REGISTER OF PATENTS.

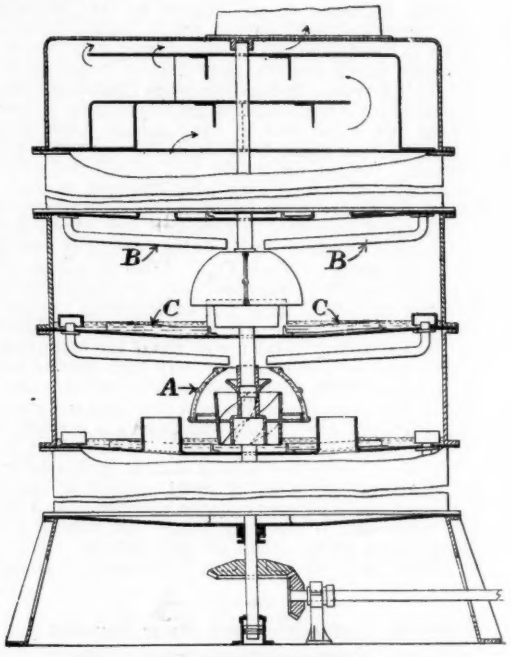
Apparatus for Effecting Intimate Contact of Gases and Liquids.—No. 206,174.

WRIGHT, S., and MELDRUMS, LTD., both of Timperley.

No. 12,024; April 29, 1922.

This invention for effecting intimate contact of gases and liquids relates to apparatus comprising one or more compartments in which the liquid is broken up into a fine spray by a rotary atomizer device having means for collecting liquid from the compartment.

We reproduce a part-sectional elevation of one form of the scrubber, from which it will be seen that the series of atomizers is rotatable by bevel gearing. The device A comprises a vertically disposed hollow truncated cone or cylinder, having an imperforate wall and provided with internal part-spiral vanes extending from its lower end (which is submerged in the liquid to be collected) to its upper end, and a chamber of part-spherical form having a perforated peripheral wall and surrounding the upper end of the cone, which discharges into the chamber. The annular space between the cone and the casing is closed at the bottom.



Gas Scrubber—Meldrums, Ltd.

In operation, the descending water is delivered by the pipes B into the atomizer casings, whence it is projected through the perforated walls thereof in the form of a fine spray into contact with the ascending gas. Simultaneously, the collector cone in each compartment raises water from the bottom of the compartment and delivers over its upper end into the atomizer casing, whence such water is also projected in the form of a fine spray.

The bottoms of the compartments are provided with ribs C to reduce swirling of the water in the compartments. These ribs, in conjunction with the dishing of the bottoms of the compartments, enable sufficient water to be maintained in proximity to the collector, but not an excess.

From the uppermost compartment the washed gas passes through an opening into a baffled top chamber, where it deposits suspended moisture before passing off through the outlet. The gas may be drawn through the apparatus by means of a fan; and instead of the collector cones being inverted they may be arranged with their bases downward.

Distillation of Coal.—No. 206,178.

DAVIDSON, T. M., of Sharp's Lane.

No. 12,201; May 1, 1922.

No. 5969; March 1, 1923.

This invention relates to the destructive distillation of coal and similar carbonaceous substances, and particularly to distillation carried out under the conditions set forth in specification No. 195,711 [see "JOURNAL," May 30, 1923, p. 544]. Objects of the invention are to carry out the distillation in relatively large masses and in vertical or inclined retorts, and to provide means whereby the free movement of the charges may be facilitated.

The retort is provided with a secondary wall divided longitudinally into a plurality of sections, to which a reciprocatory movement is imparted in the longitudinal direction, so that the mass of coal is maintained free, thus ensuring that the charge settles compactly upon its downward movement. The sections of the inner wall are formed of metal, and may be tapered in thickness towards the lower end of the retort or reduced in thickness by a series of steps. Alternate sections have imparted to them in opposite directions a slight vertical movement through the medium of cranked shafts.

The central vapour outlet, described in patent No. 195,711, may

also be divided into longitudinal sections adapted to be reciprocated together with, or independently of, the sections of the secondary wall. In fact, a central vapour outlet tube divided in the manner described may be provided, and the divided secondary walls omitted.

Alternatively, an undivided vapour outlet tube may be provided, adapted to have a longitudinal or rotary movement imparted to it, for the purpose of maintaining the freedom of movement of the coal.

The retort towards its lower end is enlarged in diameter; and this part may be formed of firebrick, while the upper part may be formed of metal.

The two provisional and the complete specifications cover ten pages of the familiar form, and there are six sheets of drawings.

Gas Governors for Type-Setting Machines. No. 206,220.

PARTLOW, H., of Utica (N.Y.).

No. 20,921; July 31, 1922.

The object of this invention is to provide a simple and effective thermostatically controlled valve mechanism for regulating the flow of gas or heating fluid to a burner in accordance with the temperature of the element which is to be heated. It is particularly intended for use in connection with the melting pots of type-setting and other machines wherein molten metal is employed. It is particularly designed so that the temperature to which the molten metal is heated may be varied within a relatively broad range by a simple adjustment of the mechanism.

The patentee points out that in order properly to govern or regulate the temperature of melting-pots employed in connection with type and similar casting machines, it requires two or more thermostatic gas-valves, which must be located at differents parts of the pot. Hence the present case is intended to embrace two governors, which perform identical work, both when operated manually and automatically, but wherein the automatic mechanisms necessarily differ somewhat in the details of construction and operation. The two governors, while supplied with fuel gas by a common medium, are practically independent in all their actions. This is due mainly to the fact that one governor has parts which are constantly in direct contact with the molten metal in the melting-pot, its fuel valve being automatically operated by the changes in the temperature of the metal, while the other governor has no direct contact with the molten metal, but is operated solely by the changes in the temperature of the metallic mouth portions of the spout through which the molten metal is poured during the casting operations. One of the governors, however, is materially influenced, and its operations are partially controlled, by the other governor.

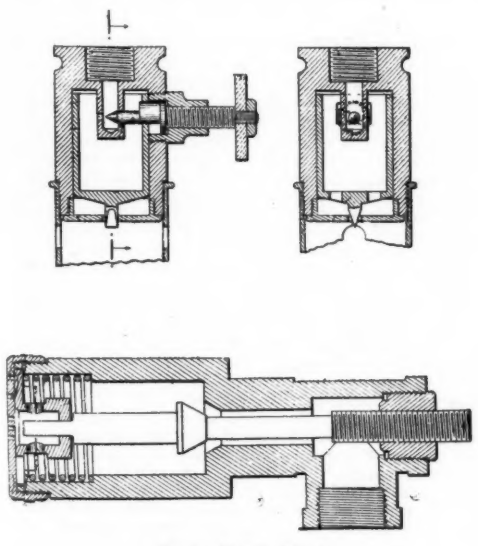
For details of the invention, readers must refer to the complete specification, which is accompanied by thirteen closely numbered drawings.

Regulators for Atmospheric Burners.—No. 206,236.

PEMBER, A. H. and H., both of Birmingham.

No. 21,082; Aug. 2, 1922.

Instead of two valves controlling respectively the pressure and the quantity of gas in atmospheric burners, the patentees claim to do this by means of a single operating device, by the continued actuation of which different relative amounts of opening of the two valves are successively obtained, "so that the regulation of the flame is rendered a simple matter."



Pember's Regulator.

Figs. 1 and 2 are sections of a form of the invention suitable for incandescent burners. It will be seen that the inlet from the supply pipe is closed by a point on a screw which also carries a cam working a sleeve which varies the needle valve to the mixing chamber.

Fig. 3 illustrates a form more suitable for a cooker. In this the ejector orifices are varied by rotation of the plate seen between the cogs and the spring in the expansion chamber.

Charging Furnaces of Gas-Retorts.—No. 206,248.

GIBSON, R. E., and NICOLL, H., both of Liverpool.

No. 21,317; Aug. 4, 1922. No. 3755; Feb. 8, 1923.

The invention refers to apparatus for handling red-hot coke discharged from gas retorts and the like, in which the coke is received on its discharge into a tube mounted on a travelling carriage that runs on the discharging stage of the retort-house, the tube having hoisting means whereby either of its ends may be raised or lowered, so that the coke may be discharged by gravity. The invention comprises improvements in the machine patented according to specification No. 175,518 [see "JOURNAL" for April 5, 1922, p. 38].

It is found in practice that the unaided gravity-feed of internal producers does not give a fuel bed of the proper depth in the rear part of the furnace, owing to the limitations imposed by the relative position of the producer and its feeding door. One of the principal objects of the present invention is to remedy this, providing mechanical means for applying pressure to the back of the charge of coke, and so supplementing gravity.

A further feature of the modification lies in the construction and operation of the coke-receiving tube, whereby the curved tubular bridge-pieces mounted on the framework of the travelling carriage of the machine (as described in patent No. 175,518) are dispensed with. It has been found in practice that, when the front end of the coke-tube is moved away from the bridge-pieces to discharge the coke by gravity, the portion of the red-hot coke contained in the bridge-pieces falls to the ground. Accordingly, instead of using fixed bridge-pieces, it is suggested that the coke-tube be built telescopically, so as to be adjustable in length to suit the various heights of the tiers of retorts; alternatively, instead of the tube having a radial movement about a point fixed in relation to the tube—resulting in a gap between its front end and the upper tiers of retorts, which requires to be bridged—the point about which the tube is hinged may be movable, so that the receiving end of the tube can be brought to within the same distance of each tier of mouthpieces. The gap in this case formed between the back end of the tube and the hinged apron plate would be bridged over by a shoot-plate.

By another construction, two coke-tubes are mounted in parallel on the carriage. One of these tubes receives coke discharged from the lower tiers of retorts. The other tube is made in two portions—namely, a fixed rear portion set in an inclined position, and a front radially movable portion hinged to the front end of the fixed inclined portion. The movable hinged part of the tube is adapted to receive coke from the upper tiers of retorts, and to pass it into the fixed tube; the hinged portion being hoisted to connect with the retorts.

The construction of the apparatus is very fully described, and covered by eighteen claims, which include the insulating lining of the coke-tube, and safety and trip gear for foolproof working.

Apparatus for Charging and Discharging Retorts. No. 206,367.

ALDRIDGE, J. G. W., of Victoria Street, S.W. 1.

No. 30,823; Nov. 10, 1922.

One object of this invention, which relates to a push-plate charger-discharger, is to improve the form and construction of the push-plates, whereby they shall be made more effective during the forward or charging stroke, and their withdrawal on the return stoke facilitated—permitting an increased charge to be deposited in the retort. This is effected by forming each plate so that its upper outer portion is set back in relation to the remainder of the plate, in order to enable the plate to rise higher and closer to the crown of the retort, as compared with a flat plate, during the operation of withdrawing from a retort.

Another object is to ensure the guiding of the apparatus centrally along the bottom of the retort, and the prevention of injury to the push plates due to impact or rubbing against the retort. For this purpose transverse guide members or arms are arranged at suitable intervals along the central bar, and project on each side slightly beyond the range of the outer edges of the push-plates; shoes or runners being fixed on the ends of the arms. These arms are made removable.

Dry Gas-Meters.—No. 206,441.

KROMSCHRÖDER, F. G., of Osnabrück.

No. 7265; March 13, 1923.

This invention has in view the reduction of the internal resistance of dry gas-meters.

Its features are parallel slide-valves having one common collecting chamber, a central partition in the meter, and the arrangement of the inlet and outlet ports and the channels connecting these ports to the measuring chambers so that they lie close to the central partition and present no deviation in the path of the flow of gas to and from the slide valves and measuring chambers.

The slide-valve arrangement, including the valve faces and the driving mechanism, is of compact design, and in appearance resembles a twin steam-engine having the cranks set at an angle of 90°. The complete valve device is disposed on one common bed-plate, which is the only part requiring soldering when attaching it to the flooring of the admission chamber.

Valve for Purifiers, &c.—No. 206,393.

DEMPSTER, R. & J., LTD., and BEARD, G. F. H., both of Manchester.

No. 34,095; Dec. 14, 1922.

The invention is for a new or improved gas-diverting valve, applicable to gas purifiers and other plant in which the gas is required to be led in different directions, such as condensers; the various operations required in practice being attained by providing in the valve or system

of valves means whereby one movement of the valve affects the flow of gas through one set of ports without affecting the flow through another set, but a further or like movement affects the flow through the second set of ports referred to, but not the first set.

The patentees claim a double-purpose gas-diverting valve comprising relatively movable parts so related that movement of predetermined extent by a single operating member operates to open and close certain ports without finally affecting others, and another movement operates to open and close said other ports without finally affecting the first-named; the one operation enabling working of the valve or system of valves with the gas flowing in one general direction, and another operation enabling working of the same with the gas flowing in a reversed general direction. The valve movement may be either of rotation or of translation.

Carbonization of Coal.—No. 206,542.

ILLINGWORTH, S. R., of Radyr.

No. 13,319; May 11, 1922.

The object of this invention for the carbonization of coal is to provide a plant which shall carry out the preliminary treatment described in specifications No. 164,104, No. 175,888 [see "JOURNAL" for April, 1922, p. 103], and No. 187,328 [Nov., 1922, p. 506], and form fuel of definite size and shape.

The invention provides in a long horizontal or inclined muffle furnace an endles chain driven by vertical sprocket wheels. On this chain is mounted a number of trays each of which is divided by partitions into compartments forming moulds. At the end of the muffle opposite where the coal is fed by a star valve, is an oven or furnace into which the trays deliver their contents as they turn over.

Carbonization proceeds from the sides of the coal in each compartment towards the middle, and consequently the outer shell of each piece becomes heated sooner than does the centre. Consequently it is only necessary to make the first furnace long enough, and to cause the trays to travel through it at such a rate that this outer shell may be sufficient to prevent fracture of the block or briquette as it falls from the tray into the oven, which may be made of sufficient size to take a charge four times as great as the charge of the first furnace.

In order to prevent waste of coal, the back of each tray overlaps the front of the tray following it; and a scraper levels the coal as the tray passes beneath it.

The horizontal furnace is heated by flues above and beneath it, in which flues are arranged burners. Some flues may also be arranged in the middle of the furnace between the upper and lower portions of the chain. An off-take is provided for the volatiles. Each end of the furnace is closed by a double door with a sand seal. At the bottom of the oven is a star valve, each arm of which is formed of a number of curved rods which pass through stationary or pivoted rods and extract the finished product from the bottom of the oven. Preferably this valve delivers the product into two cooling chambers arranged side by side beneath the bottom of the oven, a gate being provided at the tops of these chambers so that they can be filled alternately. If it is desired to preheat the coal, the preheater may be arranged above the horizontal furnace, and the waste gases therefrom may be employed.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for Dec. 5.]

Nos. 29,703 to 30,317.

BAYNES, F. W.—"Gas-generators, &c." No. 29,988.
BRITZKE, E.—"Process for producing power gas." No. 30,247.
CHANCE BROS. & CO., LTD.—"Gas-measuring apparatus." Nos. 30,097, 30,098.
DEMPSTER AND SONS, LTD., R.—"Heating horizontal retorts for gas production." No. 29,940.
DEMPSTER AND SONS, LTD., R.—"Apparatus for discharging and charging retorts, &c." No. 29,941.
ELLIS, J. W.—"Gas-burners." No. 29,877.
FOX, T.—"Wet gas-meters." No. 30,139.
GROSSMITH, G. W.—"Apparatus for filling measured quantities of coke, &c., into skips." No. 29,987.
HELPS, G.—"Gas-burners." No. 30,048.
HELPS, G.—"Atmospheric burners." No. 30,049.
HUNTER, C.—"Manufacture of combustible gases." Nos. 30,169, 30,170.
MOORE, S.—See Hunter, C. Nos. 30,169, 30,170.
PETTERS, LTD.—See Baynes, F. W. No. 29,988.
ROBINSON, S.—See Fox, T. No. 30,139.
ROYAL, C. M.—"Burning gas." No. 29,874.
SARGENT, T.—See Grossmith, G. W. No. 29 987.
SELAS AKT.-GES.—"Gas-mixing arrangements." No. 29,966.
SUTHERLAND METER COMPANY, LTD.—"Coin-controlled gas-meters." No. 30,016.
TOOGOOD, H. J.—See Dempster and Sons, Ltd., R. No. 29,940.
TWEEDIE, J.—"Pipe joints, &c." No. 30,056.
WARNANT, E.—"Gas-producer." No. 30,162.
WOLFF, F.—See Selas Akt.-Ges. No. 29,966.
WOODHEAD, C. J.—See Dempster and Sons, Ltd., R. No. 29,941.
WRAITH, H. O.—See Chance Bros. & Co., Ltd. Nos. 30,097, 30,098.

Underground London.—Mr. W. J. Liberty, of the Engineer's Department of the Corporation of the City of London, gave, on the 30th ult., a private lecture on "Underground London" in the Dining Hall of the Constance Road Institution of the Camberwell Board of Guardians. The lecture, which was illustrated by about ninety special slides which he had prepared, was a repetition, slightly amplified, of one he recently gave before the United Wards Club at the Cannon Street Hotel. Members of the Camberwell Board of Guardians and their officers and friends were invited, and there was a large and appreciative audience. Mr. Gerald Molony, J.P. (Chairman of the Guardians), presided.

MISCELLANEOUS NEWS.

GAS REGULATION ACT APPLICATIONS.

The following further notices have appeared in the "London Gazette" with regard to applications to the Board of Trade for Orders under the Gas Regulation Act.

Ashburton Urban District Council.

The maximum price now authorized in respect of the supply of gas by the undertakers is 5s. 6d. per 1000 c.ft.; and the price they have asked the Board of Trade to substitute for this is 1s. 4d. per therm.

AMENDING ORDERS.

Brighton and Hove General Gas Company.

The Company have applied to the Board of Trade under the provisions of section 1 of the Gas Regulation Act, 1920, for an Amending Order providing for the revision of the powers of charging which may be exercised by the undertakers under, and by virtue of, the Brighton and Hove Gas (Charges) Order, 1921, by substituting for the standard price of 15·2d. per therm authorized by section 3 of that Order a standard price of 14d. per therm.

Gas Light and Coke Company.

The Board of Trade gave notice that, the London County Council having made application under sub-section (3) of section 1 of the Gas Regulation Act for an Amending Order revising the powers of charging authorized by the Gas Light and Coke Company (Charges) Order, 1921, the standard price which the Board of Trade propose to authorize in lieu of the existing standard price of 15·2d. per therm is 11d. per therm.

Any person affected desiring to make representations with regard to the application may do so by letter addressed to the Director of Gas Administration, Board of Trade, Great George Street, S.W. 1, not later than Dec. 21, 1923.

A copy of such representations must at the same time be sent to the London County Council and to the Gas Light and Coke Company.

DECLARATIONS OF CALORIFIC VALUE.

Borough of Dewsbury.—500 B.Th.U. (Dec. 10.)
Newport (Mon.) Gas Company.—450 B.Th.U. (March 10, 1924.)

GAS REGULATION ACT ORDER.

We have received from the Director of Gas Administration a copy of the following further Order made by the Board of Trade under section 1 of the Gas Regulation Act.

Tamworth Gas Light and Coke Company.

After the declared date, the maximum price in respect of gas supplied by the undertakers shall be 16d. per therm.

After the declared date, "1·6d. per therm" shall be substituted for "8d. per 1000 c.ft.," and "16d. per therm" for "5s. per 1000 c.ft." in section 27 (power to charge differential price outside borough) of the Tamworth Gas Act, 1911.

THE NEWINGTON CAUSEWAY EXPLOSION.

The Ministry of Transport public inquiry into the cause of the accident on the City and South London Railway on the afternoon of Nov. 27 was held on Tuesday of last week. It will be remembered that there was a serious gas explosion, and that the accident was placarded as being due to this. To state the case briefly, owing to the work of reconstructing the City and South London Tube Railway, there was a subsidence which resulted in the fracture of the gas-main. In some way, the gas was ignited, and the explosion followed.

As the general public—in London, at any rate—knows, the City and South London Railway, the oldest of the group, is being reconstructed, and larger tunnels are being made to enable the rolling stock from other tubes to be run over the lines. On the portion of the line on the South of the Thames the work is negotiated by taking out a section or two at a time (during the night) and carrying out the work of enlargement. The traffic was maintained during the day, and parts of the tunnel which had been opened up were protected by special timbering. At about 5.15 p.m. on Nov. 25, the driver of a train ran into some timber at one of these openings; and it was found that several pieces of timbering had come away, letting in sand and gravel and a certain amount of water. Realizing the danger, he removed the obstructing timber and ran his train, containing some fifty passengers, well clear of the spot. He then telephoned to stop the oncoming train, and it should be mentioned that his promptitude of action has been recognized by the Company. Within a very short time (a matter of about half-an-hour, or less) the tunnel at the spot in question under Newington Causeway was filled with sand and gravel from top to bottom, and the current was cut off through the short circuit created. This is the story in brief; and the responsible engineers are of opinion that the accident was not due to any negligence on the part of the night gang engaged upon the work.

At the inquiry, which was conducted by Colonel Mount, of the Ministry of Transport, at the offices of the Underground and Electric Railway Company, Westminster, it was stated at the very commencement that the subsidence was the cause of the gas-main breaking, and that the explosion—which, as a matter of fact, occurred three-quarters of an hour after the trouble in the tunnel—was not the cause of the subsidence This being so, the question of gas was not mentioned

again throughout the inquiry, except in a casual way in relation to the manner in which it became ignited. Nobody, however, had the faintest notion; and Mr. Mott, the Consulting Engineer to the Railway Company, said he doubted if the cause would ever be known. For the rest, all we need say is that the South Metropolitan Gas Company, whose mains were concerned, were represented by Mr. J. J. Washington (Solicitor) and Mr. Albert Stokes (Gas Supply Manager of the Company), and that during the hearing Mr. Frank H. Jones (Vice-President of the Company) was present.

COLONIAL GAS ASSOCIATION, LTD.

Final Meeting in London.

The Thirty-Fifth Ordinary General Meeting of the Association was held on Tuesday of last week, at the Cannon Street Hotel, London, E.C.—Mr. SAMUEL SPENCER in the chair.

The SECRETARY (Mr. A. J. Kingdon) read the notice convening the meeting and the report of the Auditors; and the Directors' report and the statement of accounts were taken as read.

THE BEST BALANCE-SHEET SO FAR PRESENTED.

The CHAIRMAN, in opening his remarks to the shareholders, said he would like to tell them in the first place that he had been a Director of the Association since its inception, and Chairman for 28 years; and he, along with the other members of the Board, was pleased to be able to inform the proprietors that the balance-sheet submitted to them at this meeting—the last meeting of shareholders that was to be held in England—was the best that had ever been presented by the Directors for consideration. Unfortunately, it was not very much in advance of the immediately preceding one; but the miners' strike in May and June—which lasted some six weeks—prevented them from showing still better results, as during that time it was only possible for the Association to use up their existing stock of coal and to secure some of an inferior quality. However, it was a satisfactory feature that they had been able to maintain a full supply of gas to the consumers. Had it not been for the upset to which he had referred, without a doubt the increased sales would have reached a good percentage more; and the results now submitted must be considered fairly satisfactory in the circumstances. Recently, as the shareholders were aware, there had been an extraordinary general meeting, with a view to removing the head office to Melbourne; and that meeting, which was held on Sept. 25, at the Cannon Street Hotel, was attended by Mr. Philip Holmes Hunt, the Chairman and Managing Director in Melbourne. The proposed change was then gone fully into, and, after hearing Mr. Philip Hunt's views to the effect that the policy suggested was in the best interests of the Association, the resolution in favour of it was carried; and subsequently, on Oct. 10, this decision was unanimously confirmed. Mr. Philip Hunt was sanguine that the change would produce good results; that a Stock Exchange quotation would be given the Association in Melbourne; and that further capital would be obtainable there and in England—as the prospects of the business were very great indeed—for meeting the increased demand for gas from the extensions that were so much needed. Mr. Hunt had promised that the quotations of the Melbourne Stock Exchange should be cabled from there to the Local Board in England, who would be kept informed of all doings on the other side, so that shareholders, by calling at the London Office, would be able to keep themselves posted in all that was going on in Australia. Mr. Hunt (who, he might mention, left this country on his return to Melbourne on Nov. 17) had expressed himself as being very much in favour of half-yearly dividends being paid in the future. The Directors were greatly pleased to have had Mr. Hunt's visit, and trusted that under his able guidance as Chairman the future of the Association would be one of increasing prosperity.

FIGURES FROM THE ACCOUNTS.

Proceeding to move the adoption of the report and accounts, the Chairman said, on referring to the balance-sheet, it was satisfactory to note that, after deducting £3608 for depreciation, and adding £6952 brought forward, the amount available for final dividend on the preference shares, and for dividend on the ordinary shares for the year, was £23,236. After payment of the final dividend on the 7 p.ct. preference shares, the Directors recommended the distribution of 9 p.ct. (less tax) on the ordinary shares for the twelve months ended June 30 last, and the adding of £2000 to reserve fund account. The carry-forward to the next account would then amount to £7413, which was some £560 more than the amount brought in. The increase of capital sanctioned at the last annual meeting cost £1005, which sum had been charged against this year's profit. During the period under review, the number of consumers increased by 1178, while 400 cookers were fixed. It would be seen from the report that the Association had acquired another gas-works at Frankston, making a total of sixteen under their control. The Frankston Works would, the Melbourne Directors anticipated, turn out a very lucrative investment, as the district possessed great prospects, and by the extension of the electric railway system had been brought within an hour of Melbourne.

THE NEW ARRANGEMENTS.

In conclusion, he pointed out that the new Board in Melbourne would consist of Mr. Philip C. Holmes Hunt, Mr. John S. Weir, and Sir John W. Taverner; while, from Jan. 1 next, the London Directors would be Mr. Samuel Spencer, Mr. Charles Hunt, and Mr. H. King Hiller. These gentlemen, in Melbourne and England, had been serving as Directors for many years; and all would regret that Mr. F. R. Smith was retiring from the Board of the Association, with which he had been connected for the past 18 years. In view of the changed conditions in London, Mr. A. J. Kingdon, who had been Secretary for some 27 years, and had been connected with the Association since its inception, desired to relinquish his duties at the end of March—a step which was regretted by each member of the Board, both in this country and in Melbourne.

Mr. CHARLES HUNT formally seconded the adoption of the report and accounts.

Mr. W. J. LIBERTY, referring to the new acquisition at Frankston, asked whether the Association were proposing to work the electrical side, as well as the gas.

The CHAIRMAN replied that in all probability they would not do this for a long time. Their gas was giving satisfaction.

Mr. ALWYNE MEADE inquired whether the London Committee would be a permanent institution.

The CHAIRMAN answered that it would be.

The resolution was then put and carried unanimously.

THE DIVIDEND.

The CHAIRMAN then proposed: "That a dividend of 9 p.ct., less income-tax at 3s. in the pound, for the year ended June 30 last, be declared on the ordinary shares; that such dividend be made payable on Dec. 10; and that £2000 be added to the reserve fund account."

Mr. H. KING HILLER seconded the proposal, and remarked that he believed it was the largest dividend ever paid by the Association.

The motion was agreed to.

THE SECRETARY'S RETIREMENT.

The CHAIRMAN said the next resolution was one which he would move with great regret. The Association had, however, now come to the end of their real activities on this side; and Mr. Kingdon desired to retire from the Secretaryship at the end of March. What he now had to propose was: "That Mr. A. J. Kingdon, who has rendered faithful and valuable services to the Association as Secretary for 27 years, be granted an honorarium of £500 on his retirement." From the first, Mr. Kingdon had been a devoted servant of the Association, upright and always zealous in his business. There had never been a more faithful and trustworthy official, and it had been a pleasure to work with him all these years.

Mr. F. R. SMITH, seconding, said that he had known Mr. Kingdon for a great many years—long before he became Secretary to the Association. During the 18 years that he (Mr. Smith) had been a Director, he had been in close touch with him, and had never known a secretary take a deeper interest in his work than did Mr. Kingdon. The least they could do was to grant him this honorarium, and wish him every happiness, good health, and long life.

Mr. LIBERTY thought that £500 was rather a small sum to offer as a reward for such services as Mr. Kingdon had rendered, and suggested that the Board might re-consider the matter, with a view to increasing the amount.

Mr. D. T. LIVESEY supported this suggestion, and expressed the opinion that they should do themselves justice by voting Mr. Kingdon at least £1000 as a retiring allowance. ["Hear, hear."] He had always been most courteous and helpful in every way, and would take with him into retirement the good wishes of every one of the shareholders.

Mr. S. J. TUNGAY also thought it would be only creditable to them as an Association if the amount was increased to £1000, so as to show how Mr. Kingdon's services had been appreciated.

Mr. W. J. DAVEY associated himself with these views. He (the speaker) had watched the Association ever since it was founded, and, as a matter of fact, had something to do with its promotion. Though he was not a large shareholder, he represented a considerable holding in the Association; and after the expressions of opinion that had been voiced, he thought the Directors would gladly welcome the opportunity of increasing the honorarium to Mr. Kingdon.

Mr. A. A. SAWARD, as an original shareholder, supported the remarks already made, and urged that the gratuity should be advanced to £1000.

The CHAIRMAN replied that the Directors had acted in the best interests of the Association. They had satisfied Mr. Kingdon in the matter of the amount of the honorarium.

Mr. LIVESEY said that even if Mr. Kingdon was satisfied, he did not think the shareholders should be. If the Directors could not see their way to accept the views expressed at the meeting, he would move as an amendment: "That an amount of £1000 be given to Mr. Kingdon, instead of £500."

Mr. W. CHAFFER seconded this, while appreciating the position taken up by the Board. The Association had not always been so prosperous as was the case to-day.

The amendment was put to the meeting, and agreed to *nem. con.*

Mr. KINGDON, in returning thanks, said he deeply appreciated the kind sentiments which had been expressed by the Directors and shareholders, and their recognition of his services. He felt it was a somewhat unique position to have served the Association for 27 years under one Chairman—their good friend Mr. Samuel Spencer. He heartily wished the Association continued prosperity.

VOTES OF THANKS.

On the proposition of the CHAIRMAN, seconded by Mr. SAWARD, a hearty vote of thanks was passed to the Local Board in Melbourne, and to the whole of the staff.

Mr. LIVESEY proposed a similar vote to the Chairman and Directors, and that some tangible recognition of the long services of Mr. Spencer should be made. He suggested that a sum of fifty guineas should be set aside for this purpose, and that a small Committee of Directors and shareholders should be selected to carry out the idea.

Mr. DAVEY seconded, and expressed his admiration of the Chairman, and of his great work for the gas industry.

Mr. LIBERTY agreed, and added that they would all desire also to thank specially Mr. Charles Hunt for the invaluable services which he had placed at the disposal of the Association for a large number of years.

The resolution having been carried unanimously,

The CHAIRMAN said that, while he regretted the change that was about to be made, it must be admitted that London had not given them what they wanted in the way of capital, in spite of the fact that they had never missed a dividend since 1888. He had never been connected with an undertaking with which he had been better pleased than with this one. It was 57 years since he came to London, and Mr. Hunt was a friend of his before this. No man in England was

better respected than Mr. Hunt. ["Hear, hear."] As for himself, all he desired was the shareholders' goodwill and a record on paper, for preservation by him, of their appreciation.

Mr. CHARLES HUNT said he was very much obliged for the kind references that had been made to him. For many years he had worked harmoniously with their respected Chairman, and he would not want to leave the Association so long as Mr. Spencer remained. He trusted that even greater prosperity would accrue to the undertaking in the future than had done in the past.

TRADE NOTES.

The Welsbach Light Company, Ltd.

This firm have issued an excellent selection of new showcards, window bills, &c. These are remarkably well prepared, and the majority contain the well-known slogan that a "Welsbach" house is a "lighthouse."

Gas-Works Fatality.—An inquest was held last week on a stoker named Adamson, who died as the result of an unusual accident at the Batley Gas-Works. It was stated that Adamson was cleaning the off-take pipe connecting a vertical retort with a hydraulic-main, when a flame issued from the pipe, and he received burns from which he died in Batley Hospital a week later. Joseph Brook, foreman, expressed the view that a charge of coal which had been "hanging" in the retort dropped while the off-take door was open, and the gas thus generated ignited on mixing with air. The Coroner accepted this theory, and returned a verdict of "Accidental death."

Price of Gas at Stockton and District.—Reductions in the price of gas were decided on at a meeting of the Stockton Town Council last week; and from January next the rate per 1000 c.ft. will be reduced as follows: In Stockton and Thornaby, from 3s. 4d. to 3s. 1d. (7·4d. per therm); Eaglescliffe, Billingham, and Wolviston, to 3s 5·6d. (8·35d. per therm). The price to slot-meter users was decreased by 3·2d. per 1000 c.ft. in Stockton and Thornaby, and by 7·91d. in the outlying parishes. The following scale was agreed to for power consumers: Stockton and Thornaby, 2s. 8d. (6·4d. per therm) up to 50,000 c.ft., 2s. 5d. (5·8d. per therm) on exceeding this quantity; outside areas, 3s. and 2s. 6d. respectively; Yarm, 4s. per 1000 c.ft. The Chairman of the Gas Committee (Alderman M'Naughton) said the reductions were equivalent to a saving to gas consumers of £1954 for the quarter ending in March next. He also pointed out that the reduced prices were subject to 10 p.ct. discount for ordinary consumers, and slot-meter users would receive one penny in the shilling discount. They were now deriving the benefit of the reconstruction of the works carried out during the past three years. At Yarm, where the gas-works had just been purchased by the Corporation, ordinary meter users would pay 5s. per 1000 c.ft., less 10 p.ct. discount, and slot-meter users would be given 18 c.ft. for one penny. The consumption of gas was rapidly increasing.

THE NORTH-EAST COAST COAL TRADE.

From our Own Correspondent.

The election and the political situation appear to have had little effect on the market so far. By those who favoured a protection policy, it had been hoped that a home demand for industrial purposes on something like the old scale might result, making the coal trade not so entirely dependent upon foreign demand as it is at present. What is to happen, they ask, if and when the Ruhr coalfields resume full production?

The chief feature of the past week was a sudden slump one day of 1s. 6d. in the price of Northumberland steams. A partial recovery followed; but the sudden drop was sensational. It did not, however, affect confidence in the rest of the market, and even Durham steams maintained their price; best screened nuts being fully booked, and quoting nominally 27s. f.o.b.

Coking coal remained a firm market, especially for best qualities, which are in very short supply for this month and January, and quote 25s. 6d. steadily. Odd parcels are thrown on the market from time to time, when tonnage is delayed by weather conditions, so that bargains can occasionally be picked up at below market rate. But, though buyers will not pay these prices over the whole of next year, sellers are very strong in their ideas. Gas coal has maintained the firmer tendency noticed last week, and prices have made some advance. Wear specials now quote 24s. 3d. to 25s. f.o.b., and best qualities (Holmside, Boldon, New Pelton class) are firm at 24s. 6d. minimum. Other qualities are better at 23s. to 23s. 6d. While collieries would not necessarily hold out for these prices for old and regular business, they are an indication that the gas coal collieries view the position more hopefully in common with the rest.

YORKSHIRE AND LANCASHIRE COAL TRADE.

From a Local Correspondent.

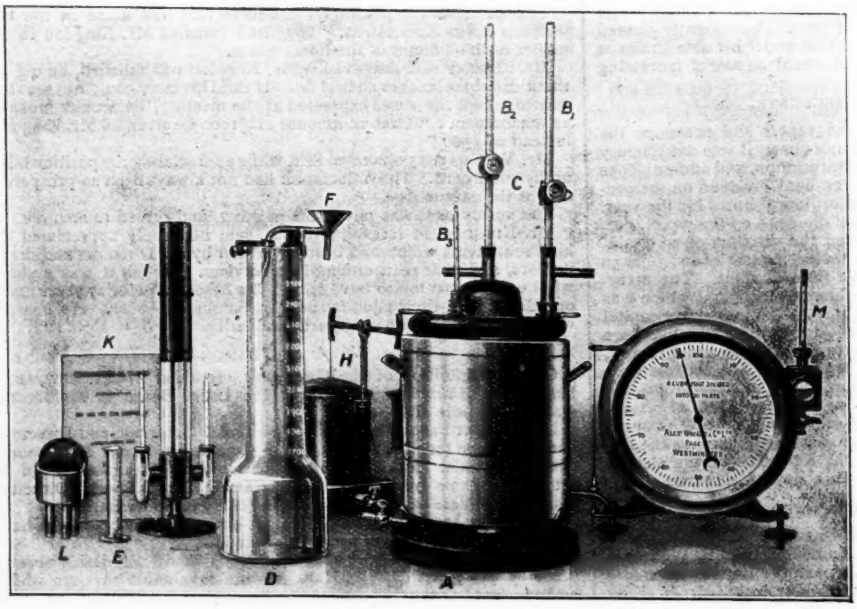
The coal trade reports from Yorkshire and Lancashire show that there are still a few gas concerns who have not purchased their immediate requirements; but these are not of any great importance, the majority having covered themselves to the end of June next.

The domestic trade shows a decided improvement—as is usually the case at this time of the year. As a consequence, prices for this description of fuel have been advanced—in some cases by one stroke—2s. per ton. Orders are being executed within a period of six or seven days; and while collieries are working full time, they report a shortage of wagons, which is causing some difficulty.

The industrial situation appears to be better, and, as a result, the higher grades of steam fuel are in greater demand than they were some weeks ago. Whether this is temporary, in view of the uncertain position created by the election, is an open question.

The shipping outlook is rather doubtful. Inquiries from the nearer

BOYS CALORIMETER



GAS REGULATION ACT, 1920.

CALORIMETER

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Continental countries, including Germany, are weaker; but this is easily accounted for by the rates of exchange now operating with France, Belgium, and Germany. A settlement of the Ruhr question would relieve matters to some extent. The situation to-day leads to the suggestion that if British industries recover and the Ruhr problem is settled, there will be a shortage of coal in this country.

COAL TRADE IN THE MIDLANDS.

From our Local Correspondent.

The rush for quick supplies of household fuel has aggravated the difficulties of distribution arising from fog and local dislocations. Stringency has resulted in many directions, and there has been a sharp appreciation of prices. The advances made are very irregular. They are determined largely by local and individual conditions. Some collieries that notified an advance of 1s. from December have since increased the amount; there being instances in which the addition to November prices is as much as 2s. 6d. and 3s. Taking the market all round, the upward movement has not been anything like so pronounced as this, however, owing to the steadying effect of big contracts. The erratic conditions of local supplies are chiefly responsible for existing disparities. While the stringency has its origin in the house coal trade, its effects are felt in other departments. Whatever signs of weakness there were in the gas coal market a little while ago have now disappeared. There is no pressure to sell; the immediate problem being to get the output transported from the pits to the centres of consumption. Traffic delays have increased the difficulty of getting wagons. Merchants can only procure the best house coal, for which their customers are pressing, by sending their own wagons to fetch it. They now have to arrange for supplies further forward than has been the rule for a long time.

Blast furnace coke is in improving request. Ironmasters are anxiously speculating as to what the effects of the new rapprochement in the Ruhr may be.

Fire at Bolton Gas-Works.—A fire broke out last Wednesday week at the Gas Street Works of the Bolton Gas Department. An escape occurred from the purifiers. One workman was overcome by the gas, which then caught fire; the flames spreading to the oxide heaps. In attempting to get the better of the outbreak, two other workmen were gassed. The fire was extinguished by the leaking valves being adjusted.

Power Charges at Tipton.—The Gas Committee of the Tipton Urban District Council have considered the charges for gas for power, and have decided on the following prices, to be put in operation as from Jan. 1 next: Up to 100,000 c.ft., 3s. 6d. per 1000 c.ft.; up to 500,000 c.ft., 3s. 5d.; up to 1,000,000 c.ft., 3s. 3d.; up to 2,000,000 c.ft. 3s. 2d.; up to 3,000,000 c.ft., 3s.; up to 4,000,000 c.ft., 2s. 10d.; and up to 5,000,000 c.ft., 2s. 9d.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *Dec.* 10.

There is nothing new to report in the London tar products market. Pitch continues quiet, and the price is quite nominal. Creosote is firm, and not below 10d. per gallon net and naked at makers'. works. Solvent naphtha 95-160 is about 1s. 6d. per gallon, pure toluole about 1s. 9d. per gallon, pure benzole about 1s. 7d. per gallon. Other products are without change.

Tar Products in the Provinces.

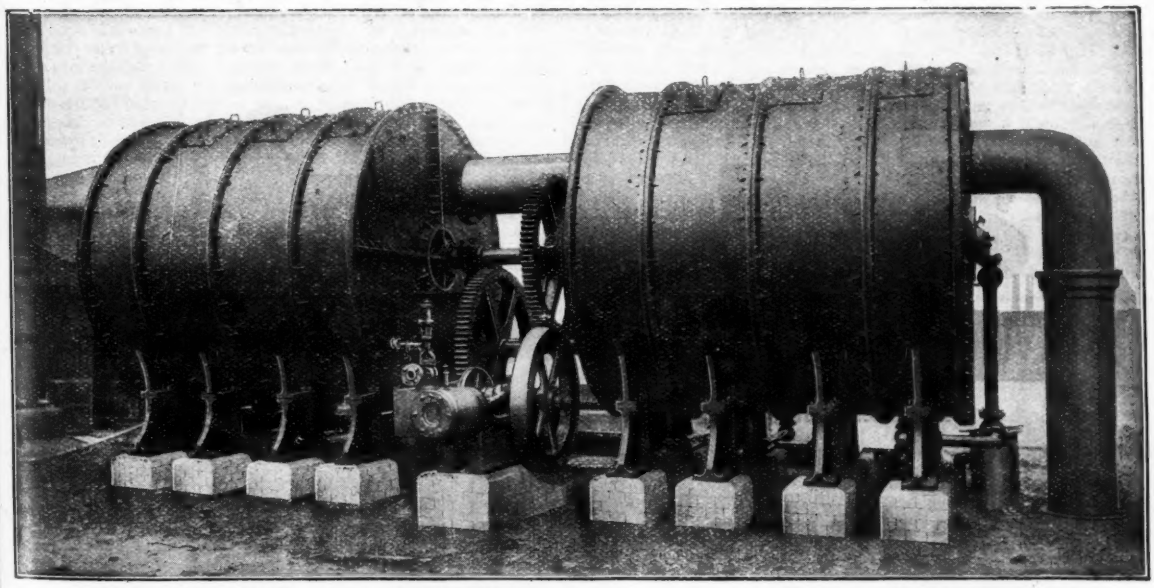
Dec. 10.

The market for tar products is very quiet indeed, with the exception of creosote oil. This article is still very firm, and apparently buyers in the United States are still prepared to go on at current prices. Pitch is very dull, and sales have been reported on the East Coast at prices as low as 100s., while considerable quantities have been sold to March next at 100s. It is certain, however, that quantities as a whole are small, and that a fall in price is solely due to absence of demand; and should any considerable inquiry come into the market, it is almost certain that an advance in prices will take place. Carbolic acid is still quiet, and there is little or no demand for crystals. Naphthalene remains dull, and any chance that existed a few weeks ago of business resulting has been stopped for the present by the fact that makers have had to increase prices, owing to the advance in creosote oil. Water white products are remaining neglected.

The average values for gas-works products during last week were: Gas-works coal tar, 65s. to 70s. Pitch, East Coast, 100s. to 105s. f.o.b. West Coast—Manchester, 95s. to 100s.; Liverpool, 96s. to 101s.; Clyde, 97s. to 102s. Benzole 90 p.ct., North, 1s. 0½d. to 1s. 1d.; crude 65 p.ct. at 120° C., 9½d. to 10d. naked at makers' works; 50-90 p.ct., naked, North, 1s. 5d. to 1s. 7d. Toluole, naked, North, 1s. 5d. to 1s. 7d., nominal. Coal tar crude naphtha in bulk, North, 7½d. to 8½d. Solvent naphtha, naked, North, 1s. 2½d. to 1s. 4d. Heavy naphtha, North, 1s. 5½d. to 1s. 7½d. Creosote, in bulk, North, liquid, 8¾d. to 8¾d.; salty, 8½d. to 8¾d.; Scotland, 7¾d. to 8¼d. Heavy oils, in bulk, North, 9d. to 9½d. Carbolic acid, 60 p.ct., 3s. to 3s. 2d. prompt. Naphthalene, £15 to £16; salts, £6 to £8, bags included. Anthracene, "A" quality, 4d. per minimum 40 p.ct., purely nominal; "B" unsaleable.

Clarmar.—A Company has been registered under this title, with a capital of £5000, to carry on business as manufacturers of accessories and apparatus connected with the illuminating and heating power of gas, spirit, oil, electricity, and other agents. The Directors are Mr. B. Cars and Mrs. C. P. Cars, and the address is No. 2, Gresham Buildings, Guildhall, London, E.C.

ROTARY SCRUBBER WASHERS



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Smethwick Gas Affairs.

During the meeting last week of the Smethwick Town Council, Mr. S. W. B. Stephen (as Chairman of the Gas Committee) made an important statement with regard to the re-organization and extension at the gas-works. Commenting upon a report that had been prepared concerning the scheme for the erection of an additional holder, to meet the increasing demand for gas, and to provide work for the unemployed, he said the land cost £3000; but there was a sum agreed upon as the cost of reproducing on another site buildings of a similar nature to those of which the vendors would become dispossessed, amounting to £11,500. The Gas Committee asked the Council to sanction a loan for £16,300. As to the holder itself, it had been decided to instal one of 3½ million c.ft. capacity; and, in addition, the scheme included the dismantling of one of the existing holders, and its conversion into a tar and liquor storage well, the provision of new station governors and railway wagons, and the laying of larger trunk mains. The total estimated cost was £129,136. For certain items, grants had been promised by the Unemployment Grants Committee to the full amount of 50 p.ct. of the interest on the loan raised for a period of fifteen years; but for the cost of the holder, the Committee would only assent to four-sevenths of the amount of the application, because the Government Department felt that some provision was absolutely necessary, owing to a shortage of storage accommodation. With regard to a recommendation to reduce the price of gas to all classes of consumers, Mr. Stephen said that for prepayment meter users there would be a reduction equal to 3·3d. per 1000 c.ft., to operate from October, and a further similar decrease in January. There would also be a flat-rate reduction of 3d. from October, and another reduction of 3d. for gas for lighting and domestic purposes. For power, there would be a flat-rate reduction of 3d. from October, and another 3d. from December. He said the work of reconstructing the vertical retorts had proved very satisfactory. The yield of gas was in the region of 18,000 c.ft. per ton of coal carbonized, while the quality was higher.

Reduction at Seaford.—Notice is given by the Seaford Gas Company, Ltd., that the price of gas will be reduced by 3d. per 1000 c.ft., as from the Christmas meter readings.

Further Price Reduction at Hull.—The British Gas Light Company, Ltd., announce at Hull that, from and after the reading of the meters for the current quarter, the price of gas will be further reduced from 8d. to 7½d. per therm.

Another Electricity Failure at Hull.—Last week Hull was once again unfortunate. This time the failure of electric current synchronized with the envelopment of the city in a dense fog. These little happenings do much to advertise the advantages of gas. In this connection it is of interest to quote the "Eastern Morning News," which states that "the brightest spot in the city was undoubtedly the British Gas Light Company's offices."

Barrow Gas Cheaper.—The Barrow Town Council have approved the recommendation of the Gas and Water Committee that the price of gas be reduced 3d. per 1000 c.ft. from Jan. 1 next.

Gas Manager and Plumber Gassed at Bridge of Allan.—While repairing a leakage in a gas-main at Bridge of Allan, Mr. J. A. Tait (Gas Manager) and Mr. W. Balfour were rendered unconscious by a sudden outflow of gas. Fortunately they were discovered in time to prevent any fatality.

Unemployment Grant for Devonport Gas-Works.—The Unemployment Grants Committee have approved a grant of 50 p.ct. of the interest for a period of fifteen years on the capital raised to meet expenditure connected with the provision of a new carburetted water-gas plant at the Devonport Gas-Works of the Plymouth Corporation.

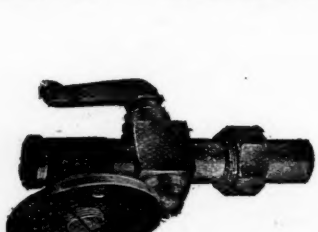
South Barracas (Buenos Aires) Gas and Coke Company, Ltd.—The accounts of the Company for the year ended Dec. 31, 1922, will be submitted to the shareholders next Wednesday, when the Directors will report that (with the debit balance brought forward) there is a total debit of £167,798. During the period under review, the Primitiva Gas Company of Buenos Aires have continued to supply all the gas required by the Company.

Turning-Down Electricity at Stoke Newington.—A decision of the Stoke Newington Borough Council to turn-down a scheme for the substitution of electricity for gas lighting has met with the disapproval of the local Ratepayers' Association, who contend that the figures for the scheme were wholly favourable—particularly in view of financial assistance being secured from the Unemployment Grants Committee. Another argument advanced is that the scheme would have given work to many unemployed.

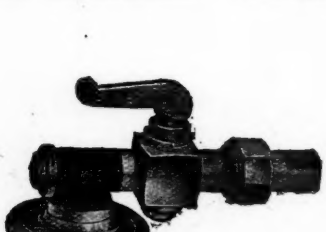
Financial Proposals at Stockton.—In connection with a Special Order to be applied for by the Stockton-on-Tees Corporation, it has been decided to ask for permission to put aside a yearly sum not exceeding £2500 towards a gas reserve fund; to take a similar sum yearly for a fund for working capital for the gas undertaking, to an aggregate amount of £5000; and to place a sum not exceeding 1 p.ct. upon the capital expenditure of the undertaking to the credit of the borough fund for utilization in the relief of rates. Any balance of the year's revenue, after making these provisions, is to be applied to reducing the gas charges.

Darlington Gas Affairs.—It was reported at last Friday's meeting of the Darlington Town Council that the gas accounts for the year ended March 31 last had been received and approved. A sum of £3000 had already been allocated in aid of the rates, and £2730 placed to reserve account. The Gas Engineer (Mr. A. E. Ruffhead) reported that a certain amount of work could be provided for the unemployed in connection with the renewal of a gasholder, the provision of new coke hoppers and screening plant, extensions of mains, &c. He was instructed to prepare estimates of the cost, and it was decided that application for assistance be made to the Unemployment Grants Committee.

TWO-WAY GAS FIRE TAP



USED AS STRAIGHT-WAY TAP



USED AS ELBOW TAP

The alteration is made by changing the position of screwed plug.

SAWER AND PURVES

NELSON METER WORKS, **MANCHESTER.**

WIRES { "SAWER MANCHESTER." "SAWER NOTTINGHAM."

RADFORD METER WORKS, **NOTTINGHAM.**

TELEPHONE NOS. { 3289 (City) MANCHESTER. 2025 (Central) NOTTINGHAM.

45/47, WESTMINSTER BRIDGE ROAD, **LONDON, S.E. 1.**

Defective Gasfitting Causes Fatality.—John Dixon (aged 89), and his wife Jane (aged 64), died in Powis Place, Bloomsbury, as the result of inhaling coal gas during the night. There was an extensive leakage of gas from a split in a three-light pendant in the room occupied by Mrs. Dixon. An inspector of the Gas Light and Coke Company stated that the stem of the fitting had perished, and had suddenly split. A verdict of "Accidental death" was returned.

Camphor Oil as an Antidote for Gas Poisoning.—How a girl, who for several hours had been unconscious through gas poisoning, was brought round in three minutes by an injection of camphor oil, is recorded in this week's issue of the "Lancet." After pointing out that camphor is a circulatory stimulant in much greater esteem on the Continent than in this country, the "Lancet" says: "Subcutaneous injections have long been used, especially for children, but it is only recently that it has been shown that camphor oil can with impunity be injected directly into the circulation, and that the reaction is immediate. The stimulating effect on the circulation of camphor oil has recently been emphasized by Dr. Erich Schilling, of Kuchwald, who has used camphor in this way in many cases of marked collapse."

Irish Gas Prices.—It was announced, at a meeting of Limerick Corporation, that, as the result of the introduction of new machinery, the price of gas would be reduced in January by 9d. per 1000 c.ft., with 10 p.ct. remission for engines. The Drogheda Corporation approved a suggestion of the Manager of the Gas-Works (Mr. P. J. Fitzpatrick) that application should be made to the Free State Ministry of Industry and Commerce for liberty to fix the price of gas at 7s. 6d. per 1000 c.ft maximum, as against the present maximum of 5s. 6d. Under the new arrangement slot consumers may be charged 7s. 11d. The figures are equivalent to: Ordinary, 1s. 8d. per therm; slot, 1s. 9d. per therm. The Ministry's regulations require a £10 fee with application for an Order, and a statement showing three years' details of manufacturing costs.

Belfast Gas Meter Supplies.—At a meeting of the Belfast Corporation, on a recommendation of the Gas Committee that of twenty tenders opened for the supply of prepayment gas-meters those of three particular firms should be accepted, it was recorded that, in considering the tenders, regard had been paid to a letter received from the local Sheet Metal Workers' Society. Mr. Doran urged that the Council should give the work to local firms, and thus provide much-needed employment, instead of sending it to England or Scotland. Mr. Workman (the Chairman of the Committee) said two of the firms had branches in Belfast, where the parts were assembled, while the third, whose tender it was proposed to accept, had in the past given the very best article. A motion that the minutes be referred back to the Committee was defeated, and the recommendation was adopted.

Imperial Continental Gas Association Debentures.—The Directors of the Imperial Continental Gas Association announce that, in order to reduce the outstanding debenture debt, they have decided to offer during a limited period to exchange, free of expense, for any holdings of 3½ p.ct. debenture stock an equal nominal amount of 3½ p.ct. Conversion Loan. In the course of a circular to stockholders, the Directors state that the offer made by the Board in August last to purchase direct at the price of £77 for £100 of stock any holdings not exceeding £100 of stock is still open; but this new offer, whereby stockholders receive in exchange for their debenture stock a Government security of the same nominal value and yielding the same income, applies to all holdings, irrespective of their amounts, and is designed expressly to meet the stockholders' convenience, and to save them the trouble and costs attendant upon the re-investment of the cash received.

Burnley Gas-Works Management.—The Burnley Gas Committee have had several meetings recently in connection with the prospective changes through the resignation of Mr. J. P. Leather, the Gas Engineer, and have discussed the arrangements to be made for the preparation and carrying out of the scheme for the construction of new gas-works at Old Hall. Mr. Leather stated that if he were relieved of the duties of Gas Engineer immediately, he would be prepared to devote himself to the preparation of a scheme which would be ready for submission to the Committee in three months' time. The Committee agreed, therefore, that Mr. Leather should be freed at once to prepare a scheme, in collaboration with the Borough Surveyor, and that the remuneration to be paid him for this work be £250, in addition to his salary as Gas Engineer to Jan. 31 next. The Committee decided that the salary of the new Gas Engineer be £800 per annum, rising to £900 by two annual increments of £50. All these matters came before the meeting of the Town Council last Wednesday afternoon, and were approved without discussion.

South Metropolitan Gas Company's War Memorial.—A memorial window to the employees of the South Metropolitan Gas Company who fell in the war (386 in number) was formally unveiled in Southwark Cathedral last Saturday afternoon, at a service attended by Directors, officials, and men of the Company and relatives of the fallen. In the absence, through illness, of Dr. Charles Carpenter (the President of the Company), the window was unveiled by Mr. Frank H. Jones (the Vice-President), and it was dedicated by the Bishop of Southwark, who said that the record of the Company was a noble one.

The Malta and Mediterranean Gas Company have declared a dividend at the rate of 5 p.ct. per annum, free of tax, on the ordinary shares for the past half-year, payable on Dec. 15.

In Spring Gardens, Buxton, leakage of gas from a main into the sewer resulted in an explosion, by which two manhole covers were thrown some distance. Several people who were passing at the time had narrow escapes, but luckily no one was seriously injured.

The Adwick Urban District Council have declined to enter into a ten years' agreement with the Brodsworth Gas Company for a system of street lighting by gas. The Council will only consider a three years' agreement, because they contend that in less than ten years the streets in their area will be lighted by electricity.

The Hereford Drapers' Association have suggested that for a fortnight during the Christmas season tradesmen in the town should allow their shops to be illuminated for at least two hours after closing time. This has been taken up as an excellent idea, and one which, if generally adopted, will tend to increase the trade of the town.

The accounts of the Power-Gas Corporation for the year ended Sept. 30 show a profit of £14,197 (against £16.245 for the preceding year), and a balance brought forward of £10,858; the total credit to profit and loss being £25,055. A sum of £2000 has been added to reserve, and a dividend is proposed of 4 p.ct., less tax, leaving £11,070 to be carried forward.

The Public Control Committee of the London County Council, having invited tenders from selected firms for the supply of five pairs of 10 c.ft. holders, with the necessary testing tables and fittings, for the new Finsbury gas-meter testing-office, decided (subject to the Council approving the necessary capital estimate and capital vote) to accept the lowest tender—that submitted by Messrs. Parkinson and W. & B. Cowan, Ltd. The report of the Committee was adopted by the Council without comment.

At the Hull Station of the British Gas Light Company, Ltd., on the 4th inst., in connection with the Cricket and Bowling Clubs, and Ambulance and Fire Brigades, the annual entertainment, attended by the workmen and their relatives, was held in the works dining hall, which was tastefully decorated for the occasion. The Engineer and Manager (Mr. Harold E. Copp, M.Inst.C.E.), as President of the Clubs, occupied the chair, and was supported by Mr. E. A. Harman, M.Inst.C.E., Mr. F. C. Robinson, Mr. E. S. Benson, Superintendent Parker (Hull City Fire Brigade), and the various chief officials of the Clubs. The cups, medals, and prizes were presented by Mrs. Copp. The proceedings opened with a whist tournament, which was followed by an excellent musical entertainment by local artistes, with Mr. R. Dally, B.Sc., as accompanist. A hearty vote of thanks to the President, Mrs. Copp, and the artistes was accorded, on the proposition of Mr. A. Cartledge, seconded by Mr. C. Appelbee.

A cheery spirit of optimism prevailed at the second annual dinner, held recently, of the staff and employees of the Chiswick Meter and Engineering Works (Mr. James Dougall). The function was at the Steam Packet Hotel, and was presided over by the head of the firm, who was supported by Mr. R. V. Steed (Sales Manager), Mr. L. Truscott (London and Provincial Representative), Mr. J. Pitman (Works Manager), Mr. E. Williams (Chief Clerk), Mr. H. Madell (Foreman, Brass Department), and Messrs. S. J. Perry (Brentford Gas Company), R. Ford, R. Porter, T. H. Peters, and E. R. Robinson. The Chairman said he was delighted to see that the business was continually growing, and hoped when the time for the third dinner came round they would have added at least another 30 p.ct. to the number of employees. That day he had practically signed a contract for new premises. These would be for the Dougall patent automatic meter, which it was hoped would be on the market not later than March. He thought that when the gas industry had seen and examined thoroughly the new meter, it would be able to hold its own with any on the market. An excellent musical programme, provided wholly by the staff, added greatly to the enjoyment of the evening.

WILL BE PUBLISHED SHORTLY.

THE

GAS SALESMAN'S DIARY

for 1924

(With Useful Data for Reference).

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STOCK MARKET REPORT.

THE interest of the Stock Exchange last week was centred in the General Election. As the polling day approached confidence in a Conservative victory was the general belief, and in anticipation thereof markets developed a fair degree of all-round strength. Industrials were particularly buoyant in view of the benefit to be derived from Protection. There was a rude awakening on Friday morning; and though there were no sellers on an extensive scale, prices were marked down in most securities. Among British Government Stocks, the Conversion Loan was the weakest; the price falling on Friday $1\frac{3}{8}$, to $76\frac{1}{2}$. Funding Loan dropped $\frac{7}{8}$, to 88, and 5 p.ct. War Loan $\frac{5}{8}$, to 100. The fall in securities which had risen on Protection hopes was inevitable; but it is not anticipated that there will be any material depreciation in values.

The Directors of the Imperial Continental Gas Association have notified the holders of the $3\frac{1}{2}$ p.ct. debenture stock that they are prepared to exchange, free of expense, an equal amount of $3\frac{1}{2}$ p.ct. Conversion Loan for their holdings. This novel proposal is put forward in order to save clerical work, due to a large proportion of small holdings. The offer seems to be an attractive one, as in the event of a great reduction in general interest rates the value of Conversion Loan would substantially appreciate.

On the London Stock Exchange the following changes took place in gas companies' quotations last week: Continental Union ordinary rose 2 points, to 32-37; while the 7 p.ct. preference fell 5, to 85-90. Oriental rose 2, to 97-102 *ex* div., Primitiva 4 p.ct. debenture fell $\frac{1}{2}$, to 70-75 *ex* div., and South Metropolitan also declined $\frac{1}{2}$, to 96-98.

The following transactions were recorded during the week: On Monday, Bournemouth 6 p.ct. preference $11\frac{15}{16}$, $11\frac{15}{16}$, Gas Light and Coke $93\frac{5}{8}$, $93\frac{3}{8}$, $94\frac{1}{8}$, $94\frac{1}{4}$, $94\frac{3}{8}$, $3\frac{1}{2}$ p.ct. maximum $65\frac{1}{2}$, 4 p.ct. preference 80, Imperial Continental 143, $144\frac{1}{4}$, Liverpool 7 p.ct. preference 106, Primitiva 5 p.ct. preference 248., 24s. 3d., South Metropolitan $96\frac{1}{2}$, Tottenham "B" 102. Supplementary prices, Montevideo 5 p.ct. debenture $74\frac{1}{2}$, 75. On Tuesday, Aldershot 4 p.ct. preference $72\frac{1}{2}$, Alliance and Dublin $66\frac{1}{2}$, Brentford "A" $102\frac{3}{8}$, $103\frac{1}{4}$, "B" $103\frac{1}{4}$, $103\frac{1}{2}$, Brighton and Hove 177, British 122, Continental Union $32\frac{3}{8}$, 34, European $8\frac{1}{2}$, Gas Light and Coke $93\frac{1}{2}$, $94\frac{1}{4}$, $3\frac{1}{2}$ p.ct. maximum 65, 4 p.ct. preference 78, $79\frac{1}{2}$, Imperial Continental 144, $144\frac{1}{4}$, 145, $145\frac{1}{2}$, Oriental 102, Primitiva 5 p.ct. preference 248. 6d., 4 p.ct. debenture 73 *ex* div., 4 p.ct. (River Plate) debenture $57\frac{3}{4}$, 58, South Metropolitan $96\frac{1}{2}$, South Suburban $101\frac{1}{4}$, 102, Wandsworth "B" $120\frac{1}{2}$. Supplementary prices, Liverpool 5 p.ct. 90, Walton-on-Thames and Weybridge "A" $13\frac{3}{8}$, $13\frac{1}{2}$, Wandsworth $3\frac{1}{2}$ p.ct. new $103\frac{1}{2}$. On Wednesday, Bombay $5\frac{1}{2}$, Gas Light and Coke $93\frac{3}{8}$, 94, $94\frac{1}{2}$, 4 p.ct. preference 78, 3 p.ct. debenture $62\frac{1}{8}$, $62\frac{5}{8}$, Imperial Continental $145\frac{3}{4}$, Montevideo 49 *ex* div., Portsea Island "A" 117, "D" and "E" 99, Primitiva 58., 4 p.ct. debenture $73\frac{1}{4}$ *ex* div., South Metropolitan $96\frac{1}{2}$, $96\frac{3}{4}$, $97\frac{1}{4}$, Tottenham "B" $101\frac{5}{16}$, $101\frac{15}{16}$, 4 p.ct. debenture 80. Supplementary prices, Hong Kong and China 5 p.ct. debenture $80\frac{1}{4}$. On Thursday, Brentford "A" $102\frac{1}{2}$, British 122, 7 p.ct. preference $122\frac{1}{2}$, Commercial $3\frac{1}{2}$ p.ct. 95, 3 p.ct. debenture 60, Continental Union 35, Gas Light and Coke $93\frac{3}{4}$, 94, $94\frac{1}{2}$, 3 p.ct. debenture 62, Imperial Continental 145, Liverpool 7 p.ct. preference $106\frac{3}{4}$, South Metropolitan $96\frac{3}{4}$, 97, 3 p.ct. debenture 62, South Suburban 5 p.ct. $101\frac{1}{4}$, 5 p.ct. debenture 99. On Friday, Gas Light and Coke $93\frac{1}{2}$, $94\frac{1}{4}$, $3\frac{1}{2}$ p.ct. maximum 66, 4 p.ct. preference $79\frac{1}{2}$, Imperial Continental 146, Liverpool 7 p.ct. preference $106\frac{1}{2}$, $106\frac{3}{4}$, Primitiva 5s., 5 p.ct. preference 238., South Metropolitan 96, $96\frac{1}{2}$, 97, South Suburban 5 p.ct. 101, Tottenham "B" $102\frac{1}{2}$. Supplementary prices, Bath $96\frac{1}{2}$, British (Hull debentures) $64\frac{1}{2}$, Cape Town 5 p.ct. debentures 75, $75\frac{1}{2}$, Richmond 5 p.ct. 102, Watford "B" 98, $98\frac{1}{2}$.

The election results gave the Foreign Exchange market a nervous appearance; but support in New York caused a rally in the dollar-sterling, which touched $4.37 after dropping to $4 35. Both French and Belgian francs depreciated, and closed at 81.30 and 91 40 respectively.

In the Money Market conditions remained unaltered. Old day-to-day loans were continued at $2\frac{1}{2}$ p.ct., and fresh advances overnight were obtainable readily down to 1 p.ct. The average rate per cent. for Treasury Bills was £3 4s. 3·53d., which compares with £3 5s. 2·97d. a week ago.

Business in the Silver Market was on a small scale, and closed on the week at $33\frac{1}{16}$d. per oz.

The Bank rate is 4 p.ct., to which it was raised from 3 p.ct. on July 5. Bankers' deposit rates are 2 p.ct. The deposit rates of the discount houses are 2 p.ct. at call and $2\frac{1}{2}$ p.ct. at notice.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S TRANSACTIONS.

Issue.	Share.	When ex-Dividend.	Ante-War Dividend & Bonus.	Last Divid. at Rate of	NAME.	Closing Prices, July 30, 1914.	Variation. Quotations, Dec. 7.	Variation. Lowest and Highest Prices of Transactions.
£			p.c.	% p.a.				
131,978	Stk.	Aug. 9	—	5	Aldershot 5 p.c. max. C.	..	72—77	...
217,092	,,	,,	4	4	Do. 4 p.c. Pref.	..	70—75	72½
1,551,868	,,	Oct. 4	2½	5½	Alliance & Dublin Ord.	59—64	67—72	66½
374,000	,,	July 12	4	4	Do. 4 p.c. Deb.	76—79	62—67	...
280,000	5	Oct. 18	7½	8	Bombay, Ltd.	5½—6½	5½—5¾	5½
100,000	10	Aug. 9	16	8½	Bournemouth Gas and Water: 5 p.c.	..	12⅞—13½	...
383,110	10	,,	7	7	Bournemouth Gas and Water: B 7 p.c.	15—15½	11⅞—12⅝	...
115,000	10	,,	6	6	Bournemouth Gas and Water: Pref. 6 p.c.	13½—14	11—12	11 13/16—11 15/16
162,025	—	June 28	—	4	Bournemouth Gas and Water: 4 p.c. Deb.	..	77—82	...
992,045	Stk.	July 12	14	6 5/6	Brentford A Consolid.	261—266	100—105	102½—103½
734,920	,,	,,	11	6½	Do. B New	204—209	100—105	103½—103½
55,000	,,	,,	5	5	Do. 5 p.c. Pref.	109—111	90—95	...
227,400	,,	June 14	4	4	Do. 4 p.c. Deb.	91—93	77—82	...
214,745	,,	Aug. 23	11	11½	Brighton & Hove Orig.	208—213	175—180	177
244,200	,,	,,	8	8½	Do. A Ord. Stk.	154—159	127—132	...
1,287,500	Stk.	July 26	5	5	Bristol 5 p.c. max.	..	95—96a	...
570,000	20	Oct. 4	12½	12	British A Ord.	44—45	122—127	122
100,000	10	June 28	—	7	Do. 7 p.c. Pref.	..	122—127	122½
120,000	Stk.	,,	—	4	Do. 4 p.c. Deb. Stk	88—90	75—80	...
100,000	10	May 17	—	7	Cape Town & Dis., Ltd'	1½—2½	7—8	...
100,000	10	Oct. 31	—	4½	Do. 4½ p.c. Pref.	4—6	6—7	...
150,000	Stk.	June 28	4½	4½	Do. 4½ p.c. Deb. Stk.	70—75	75—80	...
237,860	,,	,,	—	7½	Cardiff 7½ p.c. Deb.	..	108—113	...
137,130	,,	Aug. 9	5	5	Chester 5 p.c. Ord.	108—110	85—90b	...
1,513,280	,,	July 26	5/9/4	6	Commercial 4 p.c. Stk.	106—108	95—98	...
560,000	,,	,,	5½	6	Do. 3½ p.c. do.	103—105	93—98	95
475,000	,,	June 14	3	3	Do. 3 p.c. Deb. Stk.	69½—71½	60—64	60
800,000	,,	14 Jan. 15	4	—	Continental Union, Ltd.	76—79	32—37	32½—35
200,000	,,	Dec. 14	7	4	Do. 7 p.c. Pref.	115—118	85—90	...
660,000		Aug. 9	—	6½	Croydon sliding scale.	..	102—105	...
284,975		,,	—	5	Do. max. div.	..	85—88	...
492,270	Stk.	—	6	4½	Derby Con. Stk.	123—125	107—110c	...
55,000	,,	—	4	4	Do. Deb. Stk.	102—104	74—76c	...
209,000	,,	—	—	5	East Hull 5 p.c. max.	..	..	...
1,002,180	10	July 12	10	5	European, Ltd.	17½—18	7⅞—8⅛	8⅛
16,546,120	Stk.	July 26	4/17/4	5⅛	Gas Light and Coke: 4 p.c. Ord.	98—102	93—95	93¾—94¾
2,600,000	,,	,,	3½	3½	Gas Light and Coke: 3½ p.c. max.	76—79	65—68	65—66
4,062,235	,,	,,	4	4	Light and Coke: 4 p.c. Con. Pref.	96—99	78—81	78—80
4,761,930	,,	June 14	3	3	Light and Coke: 3 p.c. Con. Deb.	72½—74½	61½—64½	62—62½
130,000	,,	Dec. 11	10	10	Light and Coke: 10 p.c. Bonds	..	..	...
42,000	—	—	—	7½	Light and Coke: 7½ p.c. Ilford Deb.	..	..	...
82,500	,,	Sept. 19	5	6⅔	Hastings & St. L. 5 p.c.	..	93—98	...
258,740	,,	,,	3½	5⅛	Do. 3½ p.c.	87—89	78—83	...
70,000	10	Oct. 18	11	10	Hongkong & China, Ltd.	16½—16¾	16—17	...
86,600	Stk.	Aug. 23	9	9½	Hornsey 7 p.c.	..	144—149	...
1,976,000	,,	Nov. 15	9	5	Imperial Continental	150—160	143—148	143—146
401,400	,,	Aug. 9	3½	3½	Do. 3½ p.c. Deb. Red.	84—86	76—78	...
235,242	,,	,,	6½	6½	Lea Bridge Ord. 5 p.c.	119—121	95—100	...
2,127,240	,,	Aug. 23	10	5⅛	Liverpool 5 p.c. Ord.	—	90—91b	90—91
600,000	,,	Sept. 19	—	7	,, 7 p.c. Pref.	—	104—107b	105½—106¾
165,736	,,	Aug. 23	7/5/6	9	Maidstone 5 p.c.	—	125—130	...
63,480	,,	June 28	—	—	Do. 5 p.c. Bonds	..	55—60	...
75,000	5	June 14	6	7	Malta & Mediterranean Met. of Melbourne: 4½ p.c. Deb.	4½—4¾	3¾—4	...
50,000	100	Oct. 1	4½	4½	Montevideo, Ltd.	99—101	95—98	...
541,920	Stk.	Nov. 29	4	4	Newcastle & Gatsh'dCon.	11½—12	48—53*	49
1,875,892	,,	July 26	4½	4½	Do. 4 p.c. Pref. Stk.	98½—99½	86—87d	86½
250,166	,,	Aug. 9	—	4	Do. 3½ p.c. Deb.	..	74½—76½d	...
329,705	,,	June 28	3½	3½	North Middlesex 10 p.c.	82—83	73—74d	...
15,000	10	Aug. 23	—	11	,, ,, 7 p.c.	..	16½—17½	...
75,940	10	,,	7/14/0	7 7/10	Oriental, Ltd.	14—15	11½—12½	...
300,000	Stk.	Nov. 29	8	9	Plym'th & Stonh'se 5 p.c.	117—122	97—102*	102
138,120	Stk.	June 28	—	7½	Portsea Island, B	..	108—113	...
60,000	50	Sept. 6	13	13	Do. C	128—131	105—110	...
100,000	50	,,	12	12	Primitiva Ord.	118—121	100—105	...
1,450,345	5	29 Oct. 14	8	—	Do. 5 p.c. Pref.	5½—6	⅛—⅜	5/-
2,499,800	5	30 Dec. 15	5	—	Do. 4 p.c. Deb.	4½—5	1 1/16—1 3/16	23/—24/6
341,400	100	Dec. 3	4	4	Do. ,, ,, 1911	91—93	70—75*	73—73½
600,000	Stk.	July 26	4	4	Do. B. Aires 4 p.c. Deb.	..	55—58	...
220,935	,,	June 28	4	4	Do. Riv. Pl. 4 p.c. Deb.	85—87	56—59	57½—58
321,670	,,	,,	4	4	San Paulo: 6 p.c. Pref.	85—87	56—59	...
150,000	10	Oct. 4	6	6	San Paulo: 5 p.c. Deb.	10½—11	5½—6	...
125,000	50	July 2	5	5	Sheffield A	47—49	38—41	...
270,000	Stk.	Aug. 23	10	5	Do. B	223—224	100—102e	...
419,968	,,	,,	10	5	Do. C	222—224	100—102e	...
1,047,000	,,	,,	10	5	Shrewsbury 5 p.c.	220—222	100—102e	...
133,201	Stk.	—	4	6	South African	..	..	...
90,000	10	Oct. 18	9	6	South Met. Ord.	10½—11½	7—9	...
5,609,895	Stk.	July 26	5/9/4	5	Do. Red. Pref.	111—113	96—98	96—97½
250,000	,,	July 12	—	5	Do. 3 p.c. Deb.	..	98—100	...
1,895,445	,,	,,	3	3	Do. 6½ p.c. Deb.	72½—74½	61—64	62
734,000	,,	Sept. 6	—	6½	South Shields Con. Stk.	..	106—108	...
91,500	,,	Aug. 23	8½	8½	S'th Suburb'n Ord. 5 p.c.	157—159	134—136d	...
1,087,795	,,	,,	6	6	Do. 5 p.c. Deb. Stk.	114—116	100—103	101—102
368,837	,,	June 28	5	5	S'th'mpt'n Ord. 5p.c. max	116—118	97—102	99
647,740	,,	Nov. 15	5	5	Do. 4 p.c. Deb. Stk.	99—102	86—89	...
121,275	,,	June 28	4	4	Swansea 7 p.c. Pref. Stk.	..	76—81	...
250,000	,,	Aug. 23	—	7	Do. 6½ p.c. Deb. Stk.	..	102—104	...
200,000	,,	June 28	—	6½	Tottenham and District: A 5 p.c.	135—138	105—107	...
120,000	,,	July 26	—	8	Tottenham and District: B 3½ p.c.	115—117	122—127	...
782,475	,,	,,	6	6½	Tottenham and District: 4 p.c. Deb.	87—89	100—105	101 5/16—102½
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